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ARMED FORCES CHEMICAL JOURNAL

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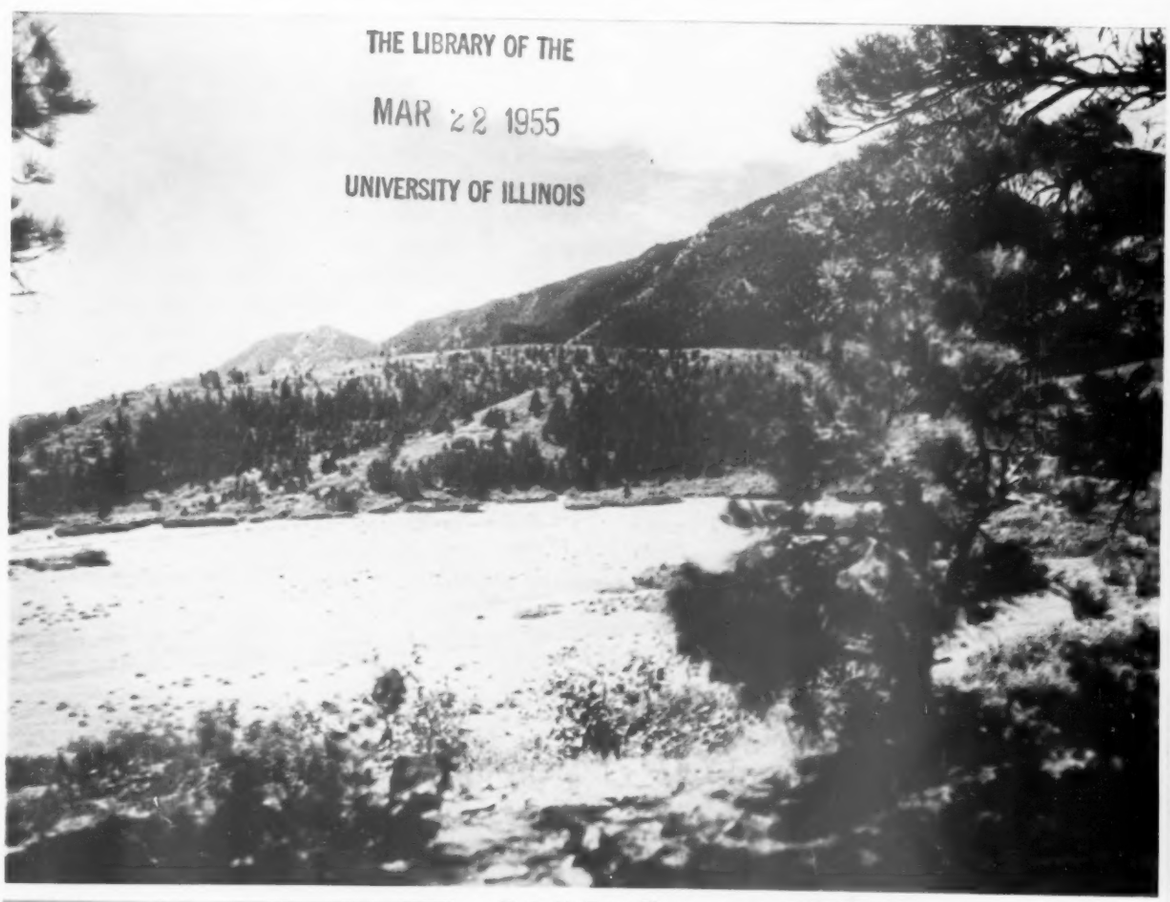

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MARCH-APRIL, 1955

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ARMED FORCES CHEMICAL JOURNAL

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COVER PHOTO

The U. S. Air Force, seeking a location for its new Academy for the education of potential officers, has selected a region noted for its scenic grandeur. This view is in the vicinity of the Academy site eight miles north of Colorado Springs, Colorado.

The Armed Forces Chemical Journal is the official publication of the Armed Forces Chemical Association. The fact that an article appears in its columns does not indicate the approval of the views expressed in it by any group or any individual other than the author. It is our policy to print articles on subjects of interest in order to stimulate thought and promote discussion; this regardless of the fact that some or all of the opinions advanced may be at variance with those held by the Armed Forces Chemical Association, National Officers, and the Editors.

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A. F. C. A. ACTIVITIES

TWO NEW COLLEGE CHAPTERS ORGANIZED

Two new student chapters, Purdue University and the Georgia Institute of Technology, have been organized and granted charters by the Executive Committee of the A. F.C.A.

The president of the Purdue Student Chapter is Mr. Arthur J. Ruess. Other charter members of the new organization are:

Messrs. Richard Bauman, Chester E. Davis, Gary Elmer, Frederick O. Fisher, Larry Geyer, Frank Hall, William A. Hankins, Joseph H. Haseman, Jr., Richard C. Herout, Forrest Hicks, Roy Ellis Hofer, Charles A. Hoffman, Leon C. Huneke, Robert D. Jackson, Clyde W. Johnson, William Katz, Solter Kokalis, Wilbur G. McMahan, James B. McNeely, James A. Richman, A. S. Robertson, Bruce B. Robertson, Manuel Sanches, Richard A. Stephans, Frank M. Sterner, Henry K. Watanabe, Darrow E. Wells, and John D. Wooledge. Also listed as members are Maj. Richard S. Clark, Maj. W. C. Lafield, Jr., and Dr. W. L. Gilliland.

The president of the Georgia Institute of Technology Student Chapter is Mr. Marvin W. Ellis, Jr., one of the A.F.C.A. award winners last year. Other charter members of this student chapter are:

Messrs. Elbert Harry Brown, John H. Burson, James H. Carlyle, Jr., Jung J. Chew, John R. Dillehay, R. E. Engel, J. E. Greasel, Lee Neel, III, Richard O. O'Bryant, Charles H. O'Neal, Richard C. Russell, Stanley C. Smith, James T. Wilburn, and Captain Norman E. Sudnick.

WILMINGTON MEETING

Dr. Justin Andrews, Assistant Surgeon General, U.S. Public Health Service, was the guest speaker at the first 1955 meeting of the Wilmington Chapter, held on January 26.

Col. F. H. Barnes, Chief, Delaware Military District; Dr. Charles Benning, City Health Officer; Dr. Victor Washburn, former City Health Officer; Dr. John Foulger, Director of Medical Research, duPont Company; Dr. Messick, and Dr. Pennington were among the other special guests.

The chapter nominated Mr. Ford McBerty of the Engineering Department of duPont as its candidate for Director-at-Large at the next A.F.C.A. election of directors.

NEW ENGLAND CHAPTER BOARD MEETING

At a recent meeting of the Board of Directors of the New England Chapter, held at the Faculty Club, M.I.T., Cambridge, Mass., it came to the attention of the Board that Mr. Lester A. Nothnagle, who for more than 40 years has been connected with the International Silver Company, Meriden, Conn., is soon to retire.

Colonel Albert A. Brown, president of the chapter, wishes to express the best wishes of the chapter to Mr. Nothnagle and its deep appreciation of his long and faithful services to A.F.C.A.

Plans for coming meetings and the chapter's spring program were discussed at the meeting.

NEW CUMBERLAND CHAPTER

The Executive Committee of A.F.C.A., at its regular meeting on January 17, approved a request for a charter of an A.F.C.A. Chapter at New Cumberland, Pennsylvania. The members of the new chapter are associated with the Chemical Supply Section of the New Cumberland General Depot.

Major Alva G. Bearden, Chemical Supply Officer, the newly elected chapter president, states he expects a total enrollment of 25 members. The other officers are: 1st vice-president, Mr. T. V. Davidson; 2nd vice-president, Mr. I. F. Zeigler; secretary-treasurer, Mrs. L. E. Randolph; directors, Messrs. W. D. Clark, E. E. Barnet, and F. S. Rupp.

WILKINSON ADDRESSES COLLEGE

Mr. W. D. Wilkinson, of Monarch Aluminum Mfg. Co., third vice-president of A.F.C.A. and vice-president of the Midwest Chapter with headquarters in Chicago, gave an address at the Industrial College of the Armed Forces in Washington, D. C., on February 7 on the subject "Military Procurement and Industry."

McCLELLAN DINNER DANCE

Reports from the Ft. McClellan Chapter indicate that their annual dinner-dance was a huge success. In addition to enjoying a delicious dinner the members spent a pleasant evening dancing to the music of the 14th Army WAC dance band in Remington Hall, which had been transformed into a winter wonderland.

PLAQUE TO COL. JOHNSON

Colonel Ragnar E. Johnson, Second Army Chemical Officer and former Commandant of the Chemical Corps School, (left) receiving A.F.C.A. plaque for meritorious service to the Association, presented by Colonel Edwin Van Keuren, Commandant of the Chemical Corps School at Ft. McClellan, Ala.

DIRECTORS-AT-LARGE

In the course of its preparation for the coming elections in the Association, the Executive Committee, at its meeting on January 17, gave consideration to the membership distribution in Areas 5 and 6.

It was decided in the best interest of the Association that the states of Montana, Wyoming, Colorado, and New Mexico should be added to the six adjoining states on the east (North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas) to comprise a new Area 5.

This move will not change the total number of directors permitted either area since the change in membership totals is of slight significance.

ACS POLICY ON TECHNICAL MANPOWER

President Prime has announced that through formal action of the Executive Committee at its meeting on February 15, 1955, the Armed Forces Chemical Association has endorsed the statement of policy promulgated by the American Chemical Society in respect to the utilization of the Nation's scientific and technical manpower.

This statement entitled "Statement of Policy on Matters Relating to Specialized Personnel" which was published in the February 7, 1955, issue of the Society's weekly magazine, "Chemical and Engineering News," is as follows:

WHEN Congress passed legislation to provide for the military strength of our country it declared that "in a free society the obligations and privileges of serving in the armed forces and the reserve components thereof should be shared generally, in accordance with a system of selection which is fair and just and which is consistent with the maintenance of an effective national economy" (Section 1, c of Public Law 51, 82nd Congress).

The obligation and privilege of serving one's country in time of need has appealed to the patriotism of millions, yes billions of people, in literally hundreds of different countries. The United States has no monopoly on this feature. It is in the desire to assure a "fair and just" system of selection that the United States differs sharply from many other nations, and it is particularly important, in the interests of freedom and democracy, that every effort to provide such a system be made. Congress realized this when in the same law (Section 1, e) it declared that "adequate provision for national security requires maximum effort in the fields of scientific research and development, and the fullest possible utilization of the nation's technological, scientific, and other critical manpower resources."

These statements were incorporated into Public Law 51 on June 19, 1951, when the United States was playing a leading role in the Korean action. Since then there has been a gradual change in the world situation and in the part played by the United States. The so-called "cold war" which followed has developed into what more accurately may be called a "technological war." Recent authentic information from Russia indicates that her leaders fear our technological superiority more than anything else. In view of the Russians' greater numerical strength, technological superiority offers the best hope of assuring our national security. It is logical that the degree to which national security can be assured is in direct proportion to our margin of superiority.

While the Soviet Union is conscious of the role of technology as the basis for both military and economic power, it is also conscious of its accomplishments in this area, accomplishments that have eliminated our superiority in certain fields and left the margin uncomfortably narrow in others.

This being true, it is even more certain now than in 1951 "that adequate provision for national security requires maximum effort in the fields of scientific research and development, and the fullest possible utilization of the nation's technological, scientific, and other critical manpower resources."

THEREFORE: In the interest of immediate as well as long range needs of our nation, it is the opinion of the Board of Directors of the AMERICAN CHEMICAL SOCIETY that every step should be taken:

1. To assure maximum and uninterrupted growth of scientific and technological developments by promoting a strong educational system at all levels which will produce an adequate flow of specialized personnel of outstanding qualifications.

2. To assure optimum utilization of specialized personnel through a system whereby both military and civilian needs will be fulfilled. This objective will require expert civilian and military judgment to determine where each person can contribute most to the national interest.

These broad objectives are not being met today. Because they are not being met, it is the opinion of the Board of Directors of the AMERICAN CHEMICAL SOCIETY *that those in Government having responsibility for the administration of the manpower program should seek:*

1. Modification of Public Law 51 (Universal Military Training and Service Act) and its administration, including a change in title, in order to guarantee the selectivity features of the law.

2. Legislation to establish a National Manpower Board in the Office of the President composed of both civilian and military personnel whose duty it shall be to determine policy and implement the administration of matters relating to specialized personnel. This legislation shall also provide for proper organization at state and local levels to ensure adequate recognition of individual abilities and local situations which provide realistic proper utilization of each reservist.

3. Legislation to provide an immediately callable reserve, under the control of the military, of such a size that it can be well organized, highly trained, and quickly mobilized to provide an effective striking force in the event of aggression, and also

4. Legislation to provide a selectively callable reserve, whose members shall not be recalled to the military except on a selection basis under the direction of the National Manpower Board.

General Electric's Nela Park.

CLEVELAND MEETING PLANS TAKE SHAPE

PLANS FOR THE 10th annual meeting of the Armed Forces Chemical Association to be held at the Hotel Cleveland, Cleveland, Ohio, June 16 and 17, are now nearly completed, according to Mr. Glenn Hutt, a vice-president of A.F.C.A., and chairman of the General Committee on Arrangements.

An incidental but nevertheless important feature of this meeting, which it is believed will prove very popular, is the provision of a coffee hour from 9:00 A.M. to 10:00 A.M. on each of the two days of the session. These morning gatherings will enable members and their guests to extend old acquaintanceships and also make new friends. However, the whole program for the first day of the meeting can be said to emphasize the idea of friendship and "get-together." It provides for a series of pleasurable events starting with the coffee hour.

After registration and the morning coffee gathering the members and guests will embus at 10:00 A.M., for a tour of the eastern suburbs of Cleveland, including two universities and part of the residential area, in time to arrive at noon at Nela Park, the establishment of the General Electric Company for the manufacture of electrical lighting equipment. As a matter of interest, particularly to old timers of the World War I Chemical Warfare Service, the Committee notes that in World War I the Nela Park area was the location of a stockade for the manufacture of the war gas known as Lewisite. The A.F.C.A. visitors will have luncheon at Nela Park, where an interesting program involving various uses of electrical lighting is being arranged. They will return at 4:00 P.M. to the Hotel Cleveland. The evening of the first day will be left open except for the officers and directors of the Association, who will hold their annual meeting at the hotel at 8:00 P.M.

The second day, Friday, June 17, will also open with a coffee hour, thus enabling the latecomers also to enjoy this social feature. The general meeting of the Association will be held that morning at 10:00 A.M. The afternoon program will be a symposium or series of presentations dealing with the functions and activities of the Chemical Corps of the Army. It is now the well-established practice of A.F.C.A. to give special emphasis to some one of the three armed forces at each annual meeting and the program this year will feature the Army. Throughout the two-day session it is planned to have on display at the hotel an exhibit of the Chemical Corps. This will be the only exhibit at the meeting.

While details for the symposium have not been fully worked out, it is hoped that Maj. Gen. William M. Creasy, Chief Chemical Officer, will be available to provide the opening address. Tentative plans provide that the next speaker will be a civilian representing chemical science and industry. It is expected that, as was the case last year, the afternoon session will include a presentation on civil defense by the Federal Administrator, the Hon. Val Peterson.

Again this year the evening program will open with the president's reception and cocktail party, followed by the banquet. While tentative arrangements have already been made for the guest speaker, the Committee will not announce the name of the speaker until a later date. It is planned to send out to members a complete statement of the program as finally arranged well in advance of the meeting.

It is expected that honored guests for the banquet this year will include a number of civilian governmental officials as well as high ranking officers of the armed services.

The Hotel Cleveland.

Invitations are being sent to the Governor of Ohio, the senators from that State, and the Mayor of Cleveland. Distinguished members of the chemical fraternity also are included on the list of specially invited guests.

Again this year as last year, the A.F.C.A. committee has provided a special program for the ladies attending the meeting. This will be on Friday, June 17. It will open with the coffee hour for all members and guests. Tentatively, depending a good deal upon the weather, it is planned to provide a boat trip on Lake Erie. It is firm, however, that the women attending the meeting will gather at noon at the Higbee Company for luncheon to be followed by a style show and card party. The program at the Higbee Company, outstanding department store, especially noted for hospitality arrangements for its patrons, has been in process of development for some time. The committee in charge has received enthusiastic cooperation from members of the Higbee Company's staff, including Miss Alice Reidel, Miss Helene St. Andrews, in charge of the style show arrangements, and Miss Frances Lucas, public relations.

Several changes in the General Committee have been made since the list was published in the January-February issue of the Journal. Mr. Hutt, general chairman, announces the designation of Admiral Prime, president of A.F.C.A. as ex officio chairman, and the appointment of the following as vice-chairmen, Colonel H. A. Kuhn (Retired), Washington, D.C.; Mr. R. R. Cutler, H. K. Ferguson Company, Cleveland, Ohio; and Mr. Harry Wansker, United-Carr Fastener Corporation, Cambridge, Mass. It is also announced that Mr. Russell Waddell, of the Harris-Seybold Company, has been named as an additional member of the Program-Exhibits Committee and a special committee for the Nela Park trip has been assigned with Mr. R. K. Stoll of E. I. duPont de Nemours & Co., Inc., Cleveland, as chairman.

Mr. Hutt outlined the program together with the tentative budget prepared by the general committee at a meeting of the Executive Committee of A.F.C.A. in Washington on January 17 and received unanimous approval from the Executive Committee of the annual meeting plans.

★ ★ ★ ARMED FORCES DAY

MAY 21, 1955

Armed Forces Day will be celebrated this year on May 21.

The Defense Department, in announcing the observance date for this year, states that since the Armed Forces Day celebration was adopted as applying to all of the armed services—Army, Navy, Air Force, Marine Corps, and Coast Guard—in lieu of having an observance day for each service, public interest has increased progressively each year. This is reflected in attendance figures for the various programs including "open house" at military posts, and parades. For instance, it is pointed out that in 1953 there were more than 500 open house programs at Armed Forces installations in the United States and overseas and that these were attended by more than 4 million persons. In 1954 the number of such programs increased to 2,300 and attracted more than 7 million visitors. In addition to these programs it is noted that in 1953 there were 433 Armed Forces parades which were viewed by 5 million persons and in 1954 there were 562 parades witnessed by an estimated 8 million persons.

For each Armed Forces Day observance a special slogan has been announced. That for 1953 was "Power for Peace" and proved so effective that it was repeated in 1954 and will be used again for the 1955 occasion.

As to the type of observance the Defense Department states that "Although Armed Forces Day is a public event and has been the occasion for a wide variety of community activities, the observance is now essentially an 'open house' program designated to promote interest in and understanding of the Armed Forces of the United States. Wherever feasible, the public is invited to visit posts, camps, stations, bases, armories, reserve centers, and other facilities in our national defense system. The public is, in effect, given an opportunity to make an annual inspection of that system, in which every American has a stake."

To facilitate participation and attendance of Armed Forces Day celebrations the Defense Department has divided the country into seven geographical areas and has designated for each area an area commander and two or more cooperating commanders. Similar arrangements have been made with respect to overseas commands.

Following are the designated areas and the area commanders:

AREA I (Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming.) Area Commander (Air Force)—Major General Richard A. Grussendorf, Commander, Tenth Air Force, Selfridge Air Force Base, Michigan.

AREA II (Arkansas, Louisiana, New Mexico, Oklahoma, Texas)—Area Commander (Army), Lieutenant General Isaac D. White, Commanding General, Fourth Army, Fort Sam Houston, San Antonio, Texas.

AREA III (Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, Washington)—Area Commander (Army), Lieutenant General Willard G. Wyman, Commanding General, Sixth Army, Presidio of San Francisco, California.

AREA IV (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont)—Area Commander (Navy), Rear Admiral Roscoe H. Hillenkoetter, Commandant, Third Naval District, 90 Church Street, New York 7, New York.

AREA V (Delaware, Kentucky, Maryland, Ohio, Pennsylvania, West Virginia, Virginia)—Area Commander (Air Force), Lieutenant General Thomas S. Power, Commander, Air Research and Development Command, Baltimore, Maryland.

AREA VI (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee)—Area Commander (Navy), Rear Admiral Heber H. McLean, Commandant, Sixth Naval District, U.S. Naval Base, Charleston, South Carolina.

AREA VII (District of Columbia and neighboring areas in Maryland and Virginia, to include Fort Belvoir and the Marine Corps Schools at Quantico)—Area Commander (Air Force), Brigadier General Stoyte O. Ross, Commander, Headquarters Command, USAF, Bolling Air Force Base, Washington 25, D.C.

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LT. GENERAL H. R. HARMON
The First Superintendent

THE UNITED STATES AIR FORCE ACADEM

By COLONEL ARTHUR E. BOUDREAU
Assistant to the Dean of Faculty

With the assembly of its first freshman class next July, the inauguration of this new educational institution in Colorado, devoted exclusively to the provision of air-minded young officers for the Regular Air Force, will mark a development of historic significance. The JOURNAL is pleased to present here this article on the aims and program of our nation's third great service academy, prepared by an Air Force officer associated with the project from its beginning.—Ed.

General Plans

THE CHIEF OF STAFF, U. S. Air Force on 16 August 1948, designated the Air University as the Air Force agency responsible for the preparation of plans for the establishment of an Air Force Academy. The Commanding General of the Air University, then Lt. General Robert W. Harper, immediately established an Air Force Academy Planning Board at his Headquarters, under the supervision of this writer, as project officer.

From the above date until March 1954 the Air Force continued preparing plans for the establishment of an Air Force Academy– pending approval of such planning by the Congress.

In March 1954 Congress passed the Air Force Academy Act, Public Law 325—83d Congress, which was signed into law by the President on 1 April 1954. This act established the Academy under the laws pertaining to the U.S. Military Academy.

As a result the organization and administration of the United States Air Force Academy will, of necessity, be much along the lines of the U.S. Military Academy, i.e., the optimum strength will be 2,496 cadets and the method of selection and appointment of cadets will eventually be as now provided for the Military Academy.

However, in order to provide for an orderly increase of cadets as well as the staff and faculty, the Air Force

Hqrs., Lowry Air Force Base, Denver, Colo., temporary location of the Academy.

Some of the buildings at Lowry being used by the Academy pending move to new site.

(U.S. Air Force Photos)

BG. GEN. DON Z. ZIMMERMAN
Dean of Faculty

COL. BOUDREAU
Asst. to Dean of Faculty

COL. R. M. STILLMAN
Commandant of Cadets

LT. COL. R. V. WHITLOW
Athletic Director

Academy Act provides that during the first four years at the Academy, the Secretary of the Air Force may limit the number of cadets to be appointed each year during that period.

Therefore, on the above basis, we plan to enter the first class of 300 cadets in July 1955, and a second class of 400 cadets in July of 1956. Our present plans are such that by the summer of 1957 construction at the permanent site will be far enough along to permit us to move these two classes to the permanent site and to enter the third class there.

As previously stated, we plan to start on a small scale and gradually build to full strength. This will be done with one small class of cadets—Freshmen. The initial location of the Air Force Academy is Lowry Air Force Base, Denver, Colorado, which will be utilized for the first two years of operation. Then the Academy will be moved to the permanent site approximately 8 miles north of the city of Colorado Springs, Colorado, at the beginning of the third year.

Program of Instruction

The foundation of the Air Force Academy Program of Instruction was laid by a group of civilian educators and leading military personnel of the three services. From the civilian educator's point of view the curriculum in its present form has been studied and endorsed by selected professors at the Massachusetts Institute of Technology, Stanford University and Columbia University.

The program of instruction at the Air Force Academy has been designed to accomplish the following:

a. Confer a Bachelor of Science degree.

b. Produce a Rated Navigator.

c. Grant a commission as 2nd Lieutenant in the Regular United States Air Force.

In order to achieve these objectives, the organization of the Academy is planned so that the academic program comes under a Dean of Faculty and the Military and Flying Training programs under a Commandant of Cadets.

The academic program is designed to include a broad coverage of both the aeronautical and social sciences.

In the Science Division a great emphasis will be placed on all phases of aeronautical theory. In presenting these subjects, each physical law, theory or principle will be related to its practical application in aircraft or aircraft equipment. In this manner the gap between theory and practice will be bridged. The first two years in the Science Division will be devoted to what may be called the "tools of the trade"! mathematics, chemistry and physics. The last two years will offer courses in mechanics, materials, electrical engineering and electronics, thermodynamics, jet propulsion, aerodynamics and aircraft design.

In presenting these courses, a close integration of subject matter is maintained with the course in aerial navigation offered by the Division of Airmanship under the Commandant of Cadets. Approximately two-thirds of the academic requirements for the production of a navigator will be absorbed by the Scientific Division under the Dean of Faculty. This is the principal reason for offering the navigation course to cadets at the Academy in lieu of the pilot training course. The pilot training program does not lend itself to a similar integration of subject matter and, therefore, it is planned to train all qualified graduates in this area after graduation from the Academy. In other words, the ultimate objective for Air Force Academy graduates is to make them Pilot-Navigators.

The cost and complexity of our heavy bombers has developed the need of an airplane commander who is responsible for the airplane as a whole and for the performance of each and every member of the crew. As such, he must be cross-trained, that is to say he must be not only a Pilot—but also an Aircraft Observer (Navigator). The need for such cross-training is highlighted also in certain new types of long range single-seater aircraft. Here a combat crew is one man. He, himself, must perform all the functions involved.

In the Social-Humanities area of instruction, every effort will be made to provide the potential Air Force officer with a knowledge of the world about him, an understanding of the peoples in that world and a skill in dealing with these people.

All courses will be integrated and coordinated to present related courses as continuous learning rather than as separate and unrelated segments of knowledge. The courses required will be English, History, Geography, Philosophy, Psychology, Law, Economics and Comparative Systems, American Government and Comparative Governments, International Relations and foreign languages.

A great deal of emphasis will be placed on English. Every effort will be made to insure that graduates are capable of using forceful, effective English, whether it be written or oral. In all subjects and on all occasions, throughout the four years, cadets will be judged on their ability to express themselves.

Foreign language courses will be offered in the last year with long periods and daily attendance. It is proposed to follow the methods of instruction developed during the World War II, placing a major emphasis on fluency and a minimum of emphasis on grammar.

Language instruction will be offered to only those cadets who demonstrate aptitude or a strong personal desire for such study. For the remainder of the class a course in Aircraft Design is planned.

At the present time a nucleus of the staff and faculty of the Air Force Academy is assembling at Lowry Air Force Base.

Here this group is finalizing plans for the reception of the first Freshman class in July of 1955.

Lt. General H. R. Harmon has been appointed as the

first Superintendent. Under his able supervision, plans for the administration of the Academy are undergoing continuous refinement for both the temporary and permanent location. Aiding the General in the development of these plans are three able assistants:

Brig. Gen. Don Z. Zimmerman—Dean of Faculty.

Col. Robert M. Stillman—Commandant of Cadets.

Col. Robert R. Gideon—Chief of Staff.

These officers and their respective staffs are aware that all planning and decisions in this matter constitute a serious responsibility. Fortunately, in approaching this problem, they are not hampered by any established customs or traditions, no preconceived ideas, or vested interest.

However, in establishing and operating the Academy they are quite naturally looking for a great deal of guidance from the other two Academies. For example, as at West Point and Annapolis, it is proposed to establish and enforce the highest standards of loyalty, integrity, and patriotism and to motivate Air Force Cadets to a lifetime of service in the armed forces.

We do not, however, intend to follow either of the two Service Academies blindly. To do so would, in many particulars, violate the mission and requirements of the Air Force. As Annapolis trains for the Navy; so West Point trains for the Army. Our mission will be to train for the Air Force. In other words, quoting from General Harmon's statement before the Senate Armed Services Committee, "our graduates will be air-faring men in the fullest sense; air minded and air experienced."

* * * *

LT. GENERAL HUBERT R. HARMON

General Harmon, the first superintendent of the new U.S. Air Force Academy, was appointed to that position on August 14, 1954.

General Harmon has had a distinguished and varied career since he graduated from the U.S. Military Academy on June 12, 1915.

During the 1920s he served as an Aide at the White House and later was U.S. Military Attache for Aviation in London. He then became an instructor at the U.S. Military Academy. In September 1940 he assumed command of the Advanced Flying School at Kelly Air Force Base, Texas, and a year later was named Commanding General of the Gulf Coast Air Forces Training Center at Randolph Air Force Base, Texas.

During World War II he commanded the Sixth and Thirteenth Air Forces, and was Deputy Commander for Air of the South Pacific Area. Since the war his assignments have included Senior Air Force Member of the Military and Naval Staff Committee of the United Nations, U.S. Delegate to the Inter-American Defense Board, and Special Assistant for Air Force Academy Matters at Headquarters, USAF.

BRIGADIER GENERAL DON Z. ZIMMERMAN

General Zimmerman is a native of Eugene, Oregon, and a graduate of the University of Oregon. He graduated also from the U.S. Military Academy in 1929. He has studied at the California Institute of Technology, and the Air Corps Tactical School. In 1940 he returned to the U.S. Military Academy for a brief tour as instructor.

During World War II General Zimmerman served in the Pacific with the Fifth Amphibious Force and the U.S. Strategic Air Force. Until recently, he has been Deputy for Intelligence for the Far East Air Force.

COLONEL ROBERT M. STILLMAN

Colonel Stillman is a native of Greenville, Ohio, and attended Colorado College before entering the U.S. Military Academy.

During World War II Colonel Stillman commanded the 322nd Bomb Group in the European Theater. He was shot down in May 1943 and was held as a prisoner of war until April 1945.

Colonel Stillman's last previous assignment was as Assistant Director of Military Personnel in Headquarters, USAF.

LT. COL. ROBERT V. WHITLOW

Lt. Colonel Robert V. Whitlow was appointed September 13, 1954, as Director of Intercollegiate Athletics for the Air Force Academy. He was a three-letter athlete at West Point after attending the University of California for three years.

During World War II Colonel Whitlow flew fighters and bombers in the European Theater of Operations, logging more than 500 hours in such operations overseas.

In addition to flying duties, Colonel Whitlow has coached Air Force football teams, including the 1952 Pacific Coast inter-service champions at Hamilton Air Force Base, California.

COLONEL ARTHUR E. BOUDREAU

Colonel Boudreau, born February 5, 1902, has spent most of his life in Massachusetts. He attended the U.S. Coast Guard Academy for a year; was graduated from Norwich University, Vermont with a B.S. degree in electrical engineering in 1924; took a postgraduate course at Harvard University in 1927; and was awarded a M.A. from Boston University in 1933 with a major in atomic physics and a minor in educational administration.

He became superintendent of schools in Winthrop, Mass. In 1942 he was commissioned in the Air Corps and from then until 1945 was in charge of the civilian educational program for the Air Force. Upon returning to civilian life he became Dean and Executive Vice-President of Inter-American College, Coral Gables, Florida.

In August 1948 Colonel Boudreau was recalled to active duty as the project officer of the Air Force Academy Board.

Colonel Boudreau was appointed as Assistant to the Dean of Faculty of the U.S. Air Force Academy, Lowry Air Force Base, Denver, Colorado, in December 1954.

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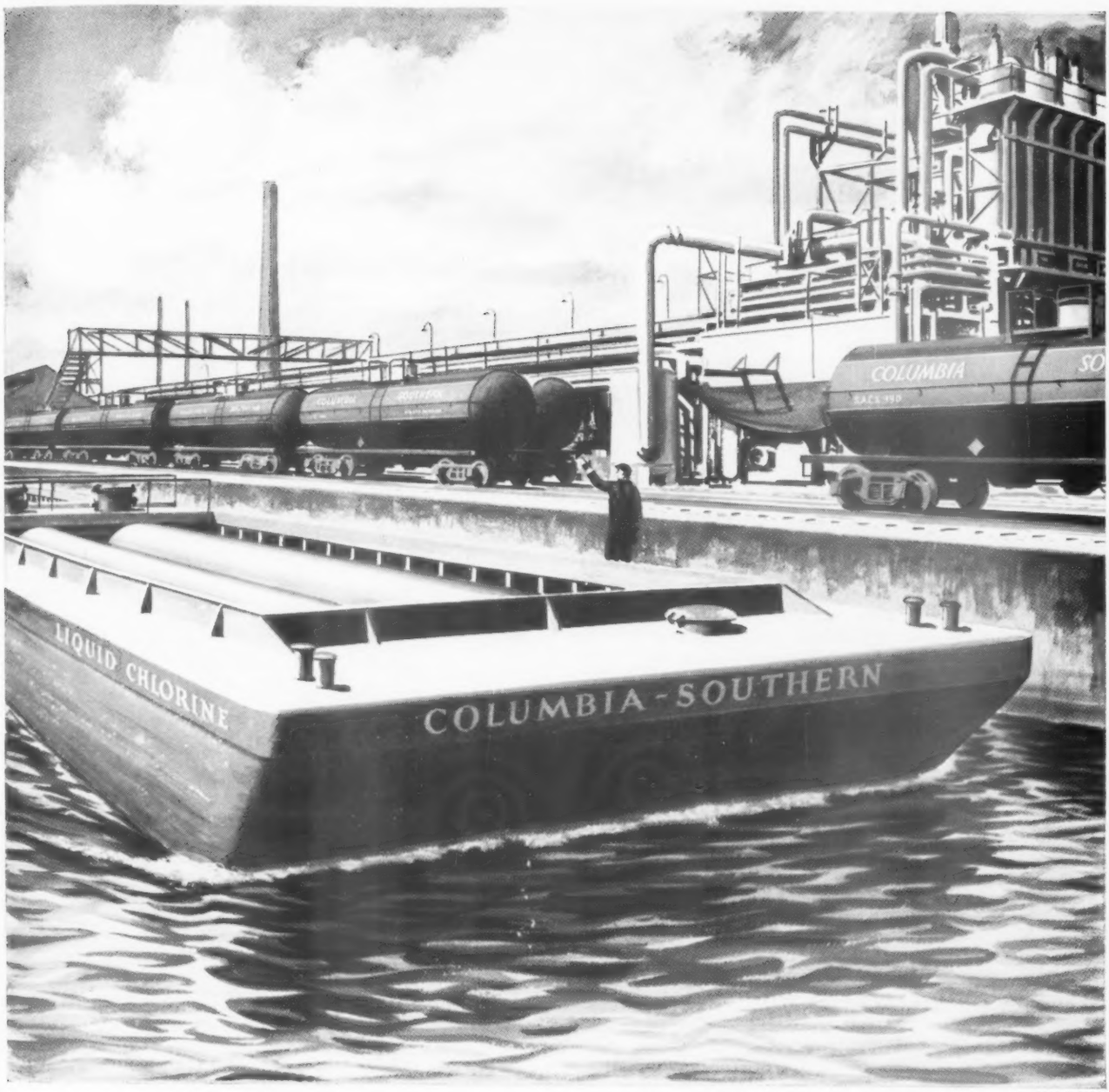

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SCIENCE AND NATIONAL POWER

A Lecture at the Industrial College of the Armed Forces

By

J. CARLTON WARD, JR.

President of the Vitro Corporation of America and Member of the Board of Advisors of the College

(Adapted from the transcription of Mr. Ward's address to the resident students and faculty of the college in Washington, D.C., on October 1, 1954, and published here with his permission and that of the Commandant of the College.)

Scope of Mr. Ward's Assignment:

HOW SCIENCE HAS AFFECTED THE CONDUCT OF WAR.

IN VIEW OF WORLD-WIDE TECHNOLOGICAL ADVANCES, IS OUR POSITION BECOMING STRONGER OR WEAKER?

IS TIME ON OUR SIDE?

WHAT IS SCIENCE DOING TO MAINTAIN THE RELATIVE POSITION OF THE UNITED STATES?

THE ACCOMPLISHMENTS OF RESEARCH AS SHOWN IN SUCH ILLUSTRATIONS AS THE CREATION OF ATOMIC ENERGY.

IN UNDERTAKING to cover this broad assignment in the period of one hour Mr. Ward, speaking rapidly, made use of 14 charts. Of these 12 are reproduced here. Specially noteworthy are Mr. Ward's development of a "Kilowatt-hour concept" of prosperity and national strength and his discussion of our current failure to produce sufficient science and engineering college graduates in this country to insure the maintenance of superiority over the U.S.S.R.

In his introduction Mr. Ward first gave a definition of science which he said would not be found in the encyclopedia but which he felt particularly suited to the purposes of the college course which opened with this lecture. "Science," he said, "is in effect the business of mastering the rules of behavior of man with his relation to the universe. Think that over. It includes the law of gravitation, mathematics, mineral resources, and other things —energy, man's capacity by himself, man as part of his own environment, his relation to his fellow men."

Mr. Ward said that the distinguishing characteristic of science compared with other branches of learning is that it is the only field "in which you can put quantitative evaluations on your conclusions." He stated that social sciences are really not sciences but are "unorganized, incommensurate material treated scientifically." Picking economics as an example of a social science he spoke of its inexactness, citing the economic unit of the "average man" as a "statistical myth." He also expressed the view that military science is really not a science but an art—the art of war. He spoke at some length in contrasting science with engineering, pointing out that by no stretch of the imagination is engineering a science. "It is an intuitive art," he stated. "This is what differentiates it from a science. You military men who must deal with engineers and scientists must not confuse these two concepts.

"What the scientist does in approaching an application of a scientific principle is sometimes strange. This is a field of engineering, and scientists in attempting at times to carry their ideas into the application stage, use strange techniques." Mr. Ward illustrated with some instances of successful results accomplished by engineers in taking liberties with scientific data and proceeding contrary to scientific theory.

In summarizing the relationships of technology and science to military matters he said these fall into five phases as follows: the research, the development, the production, the evaluation, and the phase of modification as the result of military use. He advised that the military not interfere too much in the first three of these functions, which he said pertain to the realm of the scientists and engineers.

The text (slightly condensed) of Mr. Ward's lecture from this point, continues.

* * * *

I AM TOLD next to cover the effects of science on the conduct of war. I consider this a little presumptuous. You gentlemen have studied military history. You know what Archimedes did with his pitch pots. You know how the first fellow trying to scale a castle wall must have felt when the boiling oil trickled down his spine. You know what happened when the bow and arrow was brought into

Except as otherwise indicated the charts used by Mr. Ward and shown here were prepared at the College from data gathered from various government agencies.

battle for the first time. You know what happened when gunpowder first came into use. More important, you know what happened when the atom bomb was dropped. That is the best example I can give you in bringing you up to date.

I don't have to defend the fact that the dropping of the atom bomb was a humanitarian expedient. More lives were saved by the dropping of that bomb than one can calculate. A study of the records of the Japanese military authorities shows that there would have been an abundance of defensive suicidal methods too utterly horrible to imagine. We had plenty of tests of the kamikaze situation from the Navy's point of view.

But I don't think I should put more time of today's lecture into trying to impress military students, and experts, with the effect that science has had on war. You can generalize and say that early man fought with his hands and with the energy which was supplied to him by his own processes of metabolism and assimilation of food, using as weapons only the structural parts of his body. He socked somebody on the nose. Early he learned that he could be much more effective if he used a stick. He didn't know the law of the pendulum, he didn't know the law of momentum, but he found that the other fellow's skull cracked easier under this impact. He had discovered his first weapon.

From that time on it has been a case of weapons directed by man rather than man himself. And that is the condition of war today. I think it was Nicholas Brown, once Secretary of the Navy, who said: "Gentlemen, we are about to witness the technological development of aircraft to the point where it will outstrip the human being. What are we going to do?"

The result, you know. We now design intelligence into the airplane—by electronics, by radar. We supplant the senses of man, unable to cope with his environment at 60,000 feet altitude, at speeds reaching the order of Mach one. In today's aircraft less than half a second elapses from the time the man first sees an enemy with his own eyes and the time when he can do something about it. A man can't do that. We have built into the airplane—and it accounts today for 50 per cent of the total cost of that airplane— nothing more nor less than a series of devices to take the place of man.

Radar is his new eyes. Radar can see wave lengths of light that the human eye cannot see—don't forget that a radar impulse is light. It is an electromagnetic wave, a vibration—simply a member of the spectrum beyond the biological evolution of the human eye to see; but it is light. So, in fact, we supplant man's own inferior organism, the eye, with a machine. And the cost of the airplane reaches staggering proportions.

You can extend that to ships and guns— to all war materiel. It is occurring everywhere. So let us not dwell on the fact that science has an effect on the conduct of war. I think it is fairly safe to say that weaponry and weapons systems and the intelligent use and implementation of them today spell the element of power for a nation.

Are we weaker or stronger as a world power? That is the next question.

See chart 1.—The tool of science is research. Science is absolutely a void unless it is employed. The scientific tool for expanding knowledge is research. Please look at how recently research as a function occurs in our advanced technological economy. The first research laboratory in the United States was built by General Electric Company, with only three men in it, in 1902. There wasn't any research in the United States in an organized form whatsoever. What we had previously was the old art of invention.

We learned in World War I that it was the lack of our research and development of products for war in our economy for peace that spelled our greatest shortcoming.

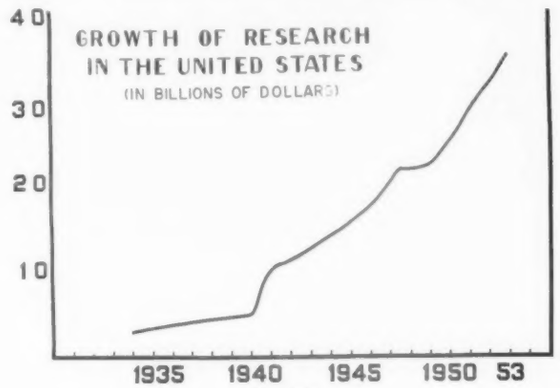

Chart 1

Look at the spurt that occurred in World War II. Because we learned this lesson in World War I, look at the total level we reached of 3,000 million a year for research in the whole United States—in Government, industry, and universities. Look at what World War II did. You can see it by the hump in that curve. Look at what Korea did. There is a tendency for the Government and industry to start relaxing after a war, and research is one of the areas of expense that always gets the first cut.

Who spends the money for research? For the year 1953 the Federal Government supplied 60 per cent; industry, 37; and universities 3 per cent. Don't be fooled, however, for that is a statistic, and the implications are inaccurate. That 3 per cent supplied by the universities, for instance, could be more important than all the rest put together. These are no commensurate units. One unit of research, one dollar of research, is not equal to another dollar of research. Sometimes the placement of a "haywire" research contract may bring in more far-reaching results than the finest, most plush, most opulent, research contract.

Fortunately, universities did 11 per cent of the research in this instance. Let me point out that this includes the nonprofit research institutions. This idea is completely new. The American universities are going through a subtle change, in which their primary purpose remains instruction, but in which instruction is enriched by attracting scholars who wish to push the boundaries of knowledge outward. But that is a dangerous approach also. If a university attempts to do too much research, it tends to become a research institution rather than an educational institution. That is occurring in the United States in certain areas.

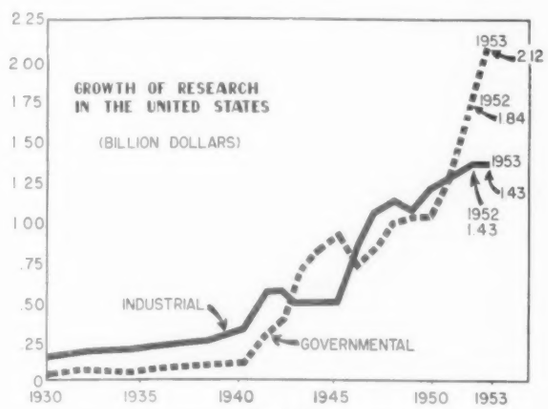

Chart 2

Chart 2.—You will see that the Federal Government does not perform in research anything like the way industry performs. The thing it does is to furnish the money. This is of course a free enterprise phenomenon and would not occur in Russia. Notice the growth of industrial research versus Government research. The lesson is here. Before the fright of World War II, Congress and the military gentlemen did very little research. Look what happened when they got scared and needed new weapons. See the rate of growth in the two trends.

Follow it all the way through and see how it sagged back after World War II. Korea got us frightened and it started upward again. You will note that we are still frightened.

NEW MATERIALS DERIVED FROM RESEARCH AND TECHNOLOGICAL DEVELOPMENT

BUTYL & BUNA RUBBER - NEOPRENE - PLASTICS

NYLON - ORLON - DACRON - RAYON - ACRYLON

UREAS - NITRATES - FORMALDEHYDES

ELEMENTAL METALS— RARE EARTHS

ANTI-BIOTICS - PHARMACEUTICALS

SILICONES - FIBER GLASS

Chart 3

Chart 3.—These products on this chart are some of the new things coming out of research—examples of what you get for your money. There are some interesting angles to that. Butyl and buna rubber, for instance, which saved us in World War II, were products of German research.

Neoprene is a complex organic product of a synthetic chemistry, the home of which was Germany and which made Germany prior to World War I the most aggressive power in the world. With the harnessing of synthetic chemistry, there was a whole new application of chemistry as a science.

It was the same thing in plastics. Don't think we don't do anything in these fields. We do. We are a nation of appliers. We are eagerly applying all the fundamental art we can distill from the older laboratories.

Nylon, orlon, dacron, rayon, acrylon—just think what these things have done to the uniforms of the soldiers. Think what all this has done to weaponry. And every bit of it stemmed out of research.

Ureas, nitrates, formaldehydes—these are the fundamental bases for a whole array of plastics, of which we have only just put together certain ones. Elemental metals and rare earths. We are only now on the horizon of a tremendous development in this field.

Chart 4.—I will now turn to the periodic chart of the atom. Let's pick a very interesting family. Any one of these is an interesting family, but here's the glamour girl —titanium. Let's take the titanium series. Remember now that in this periodic chart these elements are arranged so that those in each column tend to have similar properties. Don't be fooled. They may be similar in many of their major aspects but they have their personalities. They differ.

Silicon is one that we know a lot about. It is the basis for a lot of the new fibers, plastics, and what-not. It is also used in antibiotics, in medicine. Strangely enough, you can have a silicon chemistry. But silicon chemistry is one of the things on the horizon that can be just as complex as many that we now understand.

Then there is titanium, named after the Queen of the Fairies—Titania. It is a fairy-like material. But, like

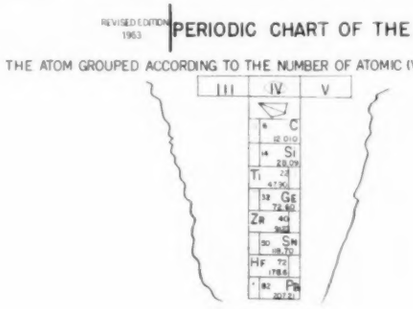

Chart 4

fairies, it is elusive. You can find any amount of titanium in the world's crust, but it is in combination. I think it is the fifth most plentiful element, but try to get it out; it is like poking a fairy out from behind a bush. It clings to its compounds. That is why it costs four or five dollars a pound today in a form that we call elementary titanium sponge.

But you all know its usefulness to the military. You know its use is common for defense weapons—from the mortar carried on the back of the doughboy on up to the airplane. It is revising all those structures, providing new weapons of lighter weight. It has high-temperature properties. It will be found in ship designs with other metals to convey the new high pressures. It has thermodynamic properties—a heat transfer medium.

There's another interesting fellow—germanium, the metal of the transistor. Look at the gold mine coming here. Who remembers germanium when he studied high school chemistry?

Look at zirconium. What is it good for? There's a very plentiful, beautiful gem called the zircon. Your wife likes to have it set in platinum as a jewel. It is quite abundant. But that is not its prime usefulness. Its real usefulness lies in zirconium oxide, one of the most valuable materials for lining furnaces, because it will withstand high temperatures. Modern metallurgical chemistry goes to high temperatures. As an oxide it is useful for one thing, as a metal for another. It is useful in an atomic pile. It has the structural properties of a metal like steel, and it has neutron properties which are ideal. It also has heat-resisting properties.

We come up with another one called hafnium. It is one with great possibilities. It is hafnium which provides the highest melting point of any known elemental metal. It is the very thing we need to get high thermodynamic efficiency in heat engines.

Let us talk now about some of the economic factors.

See chart 5.—Here we see developments in a broad sense and not products. "Atomic power" should read "atomic age," because power is synthetic here. Atomic synthesis or radiation synthesis is a new chemistry. You can take ethylene and put it in a tube, shoot atomic radiation into it, and you have polyethylene. Now you can abandon these big reactors, with their heat lines and everything, and just put a small synthetic polyethylene plant. All you need to do is push gamma rays into ethylene and it becomes polyethylene. Of course it is not that simple or we would all be doing it, but it is being done in laboratories and pilot lines now.

Gamma radiation can perform a new chemistry. Very few Americans see it now, but some scientists see it. It is

over the horizon, a liberal horizon. Gamma radiation kills bacteria, finds flaws in steel, causes chemical reactions to occur, affects biological material. It has uses for communication, like Navy sonar. It is fantastic.

TECHNOLOGICAL DEVELOPMENTS HAVING FUTURE POTENTIAL

ATOMIC POWER

ULTRASONICS

COAL HYDROGENATION

OIL SHALE EXTRACTION

CHEMISTRY OF RADIATION SYNTHESIS

FOOD STERILIZATION AND PRESERVATION BY RADIATION

— — AND OTHERS

Chart 5

Look at coal hydrogenation. This is just a simpler way of making lubricating oil out of coal, a process which we took from Germany, and then, there's oil shale extraction —that's Bureau of Mines work and is also taken from the German science. Much work is being done on that, too. Plants are being completed to tap our fossil fuel resources.

And radiation synthesis—which refers to food preservation. That is of great interest to quartermasters. It is a waste product from every atomic pile in the United States. We have arranged to find a place in the ocean where the stuff can be buried, where there will be no uplift in the ocean currents to bring it back to the surface. That makes a reverse project—how to get rid of something. But I don't think we are ultimately going to get rid of it. I think we are going to use it to sterilize meat, food, and milk. We are going to use it in synthesis to start chemical reactions. It is already being used in place of X-rays in the treatment of cancer.

Let us take the next phase of this lecture and call it "World-wide technical advances." Is our position here stronger or weaker?

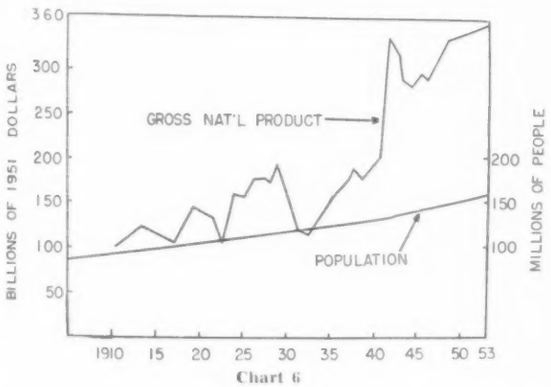

Chart 6

Chart 6.—This is the gross national product in terms of population. Social science, gentlemen. Now watch out—the gross national product must be talked of in terms of a constant commensurate factor, even for statistical purposes. So we introduce you to the standard dollar, in this case a 1951 dollar. I suggest you go to the mint and try to buy a standard dollar. You would get no such thing. It is an artificial fiction, a useful one, but an unscientific one.

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At any rate, we have it and it is the best thing we can use for statistical purposes.

But do notice that population growth. Important as it is, it does not explain the upward trend in the gross national product in our economy. All right—if this is occurring here, what is its relation to the Soviet bloc.

Chart 7.—Notice the legend on this chart. "Equivalent United States Dollars." How many rubles are equivalent to a United States dollar? Nobody knows that. And the same for all the other currencies. So picture this not as a true quantitative scientific chart, but as a trend chart. You will notice where the United States economy is. Canada is our closest neighbor and the next highest in economy to ours.

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Sweden is a northern country, which has been in business for a long period of time, has a high order of scientific and engineering attainment, and a good economy. The people have a great feeling for economic resources.

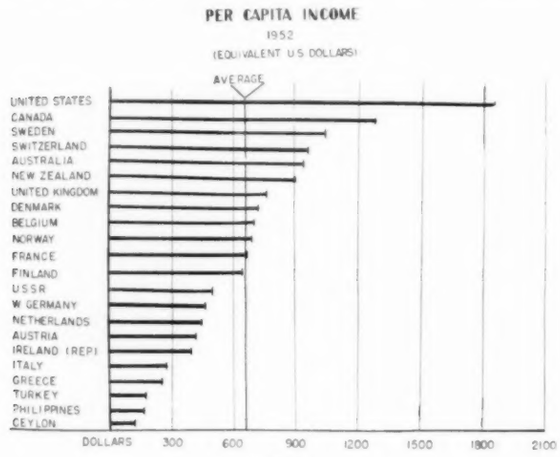

Chart 7

It comes number three. Switzerland is another country with a history very much like Sweden. It falls into fourth place.

We won't dwell on this except to point out where Russia stands, relative to our position. Are we gaining or losing? It is obvious that our position here is good. It is good, because we haven't been attacked. That is the best proof that it is still good.

Now, the fact that this (U.S.S.R.) has come up in the time of the Bolsheviks is what we want to keep our eyes on. Also the speed with which it has come up. What are the factors?

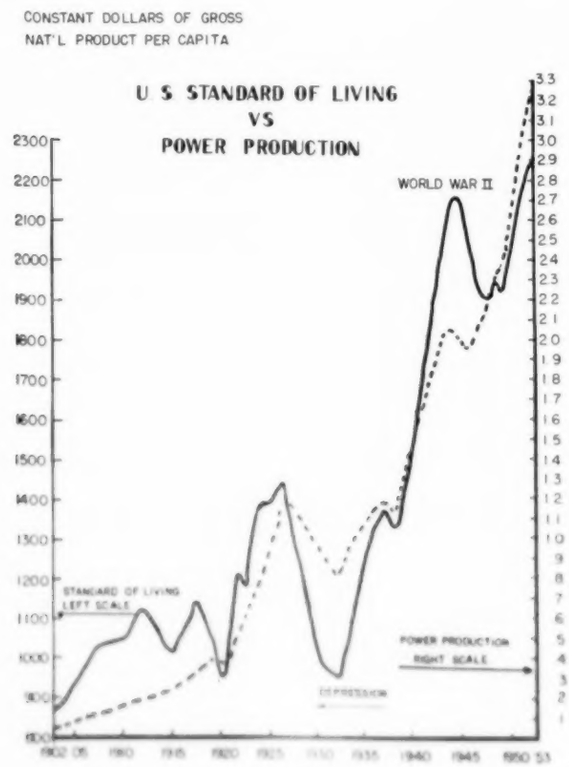

Chart 8

Chart 8.—How is the standard of living shown in this chart? Is it some form of magic? No, it is not. This curve, original with us, is the only one our company can take any credit for here. It tries to do away with one of the many bland assumptions of the economists—one with which I do not agree. They pick some period of years and say, "This is unity."

There is no such thing in all the history of man as a period of unity. I can pick a period of years and you can pick one. Three of us can draw the same chart, with the same set of rules, and get three conclusions. This chart makes no such assumptions. This chart covers the entire recorded period of over 50 years of experience without reference to anything except equalization of the dollar. What does it give you?

Kilowatt-hours do not change over the years. So we have no trouble with the scientific side of this picture. It is the social side of the picture where we have our trouble—the dollar.

In an attempt, then, to see what happens, we went back to 1902. We overlay that chart, which is the gross national product divided by the population—the standard of living—with what engineers would recognize as the cause of your standard of living. And what is that? It is the power or energy that man has to use to create goods. Goods divided by population make the standard of living. Dollars do not have a thing to do with it. They are no more than the chips you throw out in a poker game. You can make them worth 50 dollars, 50 cents or 5 cents. But you cannot make a kilowatt-hour anything but a kilowatt-hour—the equivalent of the output of 20 or 30 men working for an hour. You can talk kilowatt-hours as long as you want and they will always be the same.

Now we are plotting man's capability to use the forces of nature, to use energy. What do we find? It is our standard of living. This is fantastic, because it is so very obvious and simple. And yet books have been written about how to get the standard of living up. Laid end to end they would reach no conclusion.

The energy that man uses in machines—machinery plus energy is what we are talking about—determines his standard of living. And, gentlemen, you know your standard of living determines your economic potential. Your economic potential determines your weaponry and your logistic support. Your weaponry and logistic support determine your combat posture. Your combat posture determines your fate. That is how simple it is.

Chart 9.—This shows the electric power in the United States and its allies, as compared with Russia and its satellites. If your war potential is the same as the ability to use energy, then this represents your war posture, provided you have the morale and you have translated the energy into weaponry in a balanced proportion to your economy.

ELECTRIC POWER PRODUCTION

	(BILLIONS KWH)
UNITED STATES	513
WESTERN EUROPE	302
CANADA	65
TOTAL WEST	880
USSR	133
EUROPEAN SATELLITES	60
COMMUNIST CHINA	9
TOTAL SOVIET BLOC	202

Chart 9

You see 880 billion for the West as against 202 for Russia and its satellites—amazing. You would have to starve the Russian people in order to wring out of them more

(Continued on page 26)

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- Excellent shipping facilities to all parts of the Southeast.
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Diamond Chemicals

Chemicals you live by: Soda Ash · Caustic Soda · Chlorine & Chlorinated Products · Plastics · Silicates · Agricultural Chemicals · Chrome Compounds · Bicarbonate of Soda · Calcium Compounds · Alkali Specialties

Sweden is a northern country, which has been in business for a long period of time, has a high order of scientific and engineering attainment, and a good economy. The people have a great feeling for economic resources.

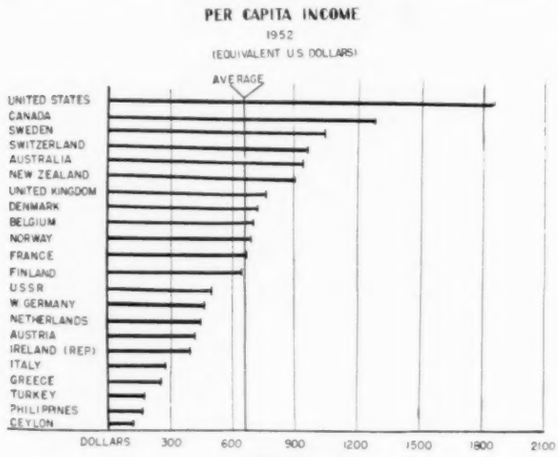

Chart 7

It comes number three. Switzerland is another country with a history very much like Sweden. It falls into fourth place.

We won't dwell on this except to point out where Russia stands, relative to our position. Are we gaining or losing? It is obvious that our position here is good. It is good, because we haven't been attacked. That is the best proof that it is still good.

Now, the fact that this (U.S.S.R.) has come up in the time of the Bolsheviks is what we want to keep our eyes on. Also the speed with which it has come up. What are the factors?

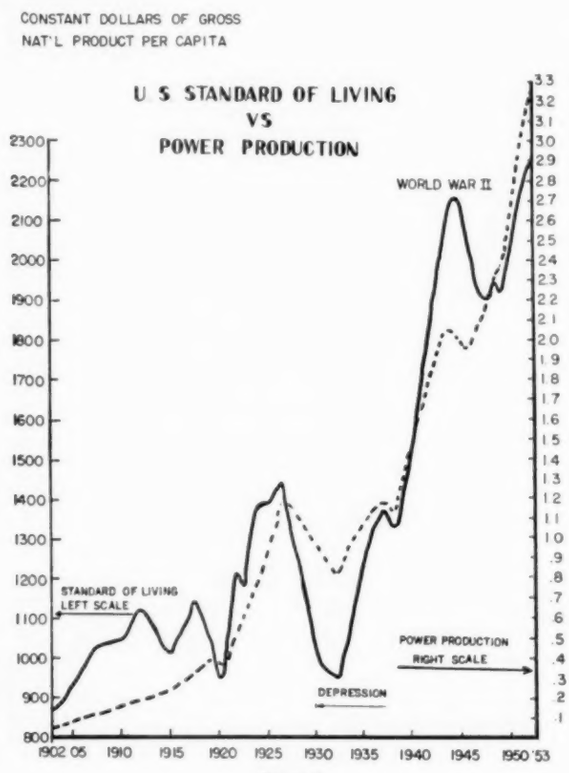

Chart 8

Chart 8.—How is the standard of living shown in this chart? Is it some form of magic? No, it is not. This curve, original with us, is the only one our company can take any credit for here. It tries to do away with one of the many bland assumptions of the economists—one with which I do not agree. They pick some period of years and say, "This is unity."

There is no such thing in all the history of man as a period of unity. I can pick a period of years and you can pick one. Three of us can draw the same chart, with the same set of rules, and get three conclusions. This chart makes no such assumptions. This chart covers the entire recorded period of over 50 years of experience without reference to anything except equalization of the dollar. What does it give you?

Kilowatt-hours do not change over the years. So we have no trouble with the scientific side of this picture. It is the social side of the picture where we have our trouble—the dollar.

In an attempt, then, to see what happens, we went back to 1902. We overlay that chart, which is the gross national product divided by the population—the standard of living—with what engineers would recognize as the cause of your standard of living. And what is that? It is the power or energy that man has to use to create goods. Goods divided by population make the standard of living. Dollars do not have a thing to do with it. They are no more than the chips you throw out in a poker game. You can make them worth 50 dollars, 50 cents or 5 cents. But you cannot make a kilowatt-hour anything but a kilowatt-hour—the equivalent of the output of 20 or 30 men working for an hour. You can talk kilowatt-hours as long as you want and they will always be the same.

Now we are plotting man's capability to use the forces of nature, to use energy. What do we find? It is our standard of living. This is fantastic, because it is so very obvious and simple. And yet books have been written about how to get the standard of living up. Laid end to end they would reach no conclusion.

The energy that man uses in machines—machinery plus energy is what we are talking about—determines the standard of living. And, gentlemen, you know your standard of living determines your economic potential. Your economic potential determines your weaponry and your logistic support. Your weaponry and logistic support determine your combat posture. Your combat posture determines your fate. That is how simple it is.

Chart 9.—This shows the electric power in the United States and its allies, as compared with Russia and its satellites. If your war potential is the same as the ability to use energy, then this represents your war posture, provided you have the morale and you have translated the energy into weaponry in a balanced proportion to your economy.

ELECTRIC POWER PRODUCTION

	(BILLIONS KWH)
UNITED STATES	513
WESTERN EUROPE	302
CANADA	65
TOTAL WEST	880
USSR	133
EUROPEAN SATELLITES	60
COMMUNIST CHINA	9
TOTAL SOVIET BLOC	202

Chart 9

You see 880 billion for the West as against 202 for Russia and its satellites—amazing. You would have to starve the Russian people in order to wring out of them m

(Continued on page 26)

MUSCLE SHOALS CHLORINE-CAUSTIC SODA PLANT NOW PART OF DIAMOND ALKALI

One of the world's most modern chlorine and caustic soda plants, located at Muscle Shoals, Alabama, and formerly owned by the Government, now is a part of DIAMOND ALKALI COMPANY.

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This marks another step in DIAMOND'S continuing program of expanding service and production facilities for the "Chemicals you live by".

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FACTS ON DIAMOND ALKALI'S NEW MUSCLE SHOALS PLANT

- Built—1950-52.
- Located on 491-acre site on Tennessee River at Muscle Shoals, Ala.
- Excellent shipping facilities to all parts of the Southeast.
- Capacity: 225 tons of chlorine per day, 250 tons of caustic soda per day.

Diamond Chemicals

Chemicals you live by: Soda Ash • Caustic Soda • Chlorine & Chlorinated Products • Plastics • Silicates • Agricultural Chemicals • Chrome Compounds • Bicarbonate of Soda • Calcium Compounds • Alkali Specialties

THE CLIMATIC FACILITY OF THE CHEMICAL CORPS MEDICAL LABORATORIES

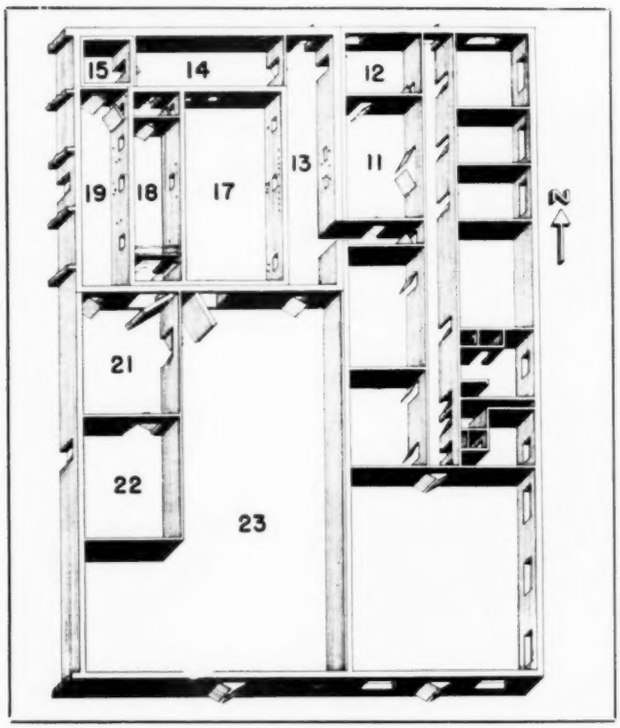


Figure 1. Floor plan of the Climatic Facility with west wing of Building 357 omitted. Indentification of the numbered rooms is as follows: 11, hot chamber; 12, toilet and shower room; 13, observation corridor; 14, dressing and clothing conditioning room; 15, small cold room; 17, all-weather chamber; 18, toxic chamber; 19, observation corridor; 21 and 22, preparation and decontamination rooms; 23, machine room. The unnumbered rooms in the east wing are laboratories and offices of the Applied Physiology Branch. The space in the adjoining west wing is at present occupied by the Clinical Investigation Branch.

Figure 2. Entrance to toxic chamber from the preparation room showing construction of the door and a mobile unit for exposing a monkey in place in the chamber.

By P. D. BALES and F. N. CRAIG

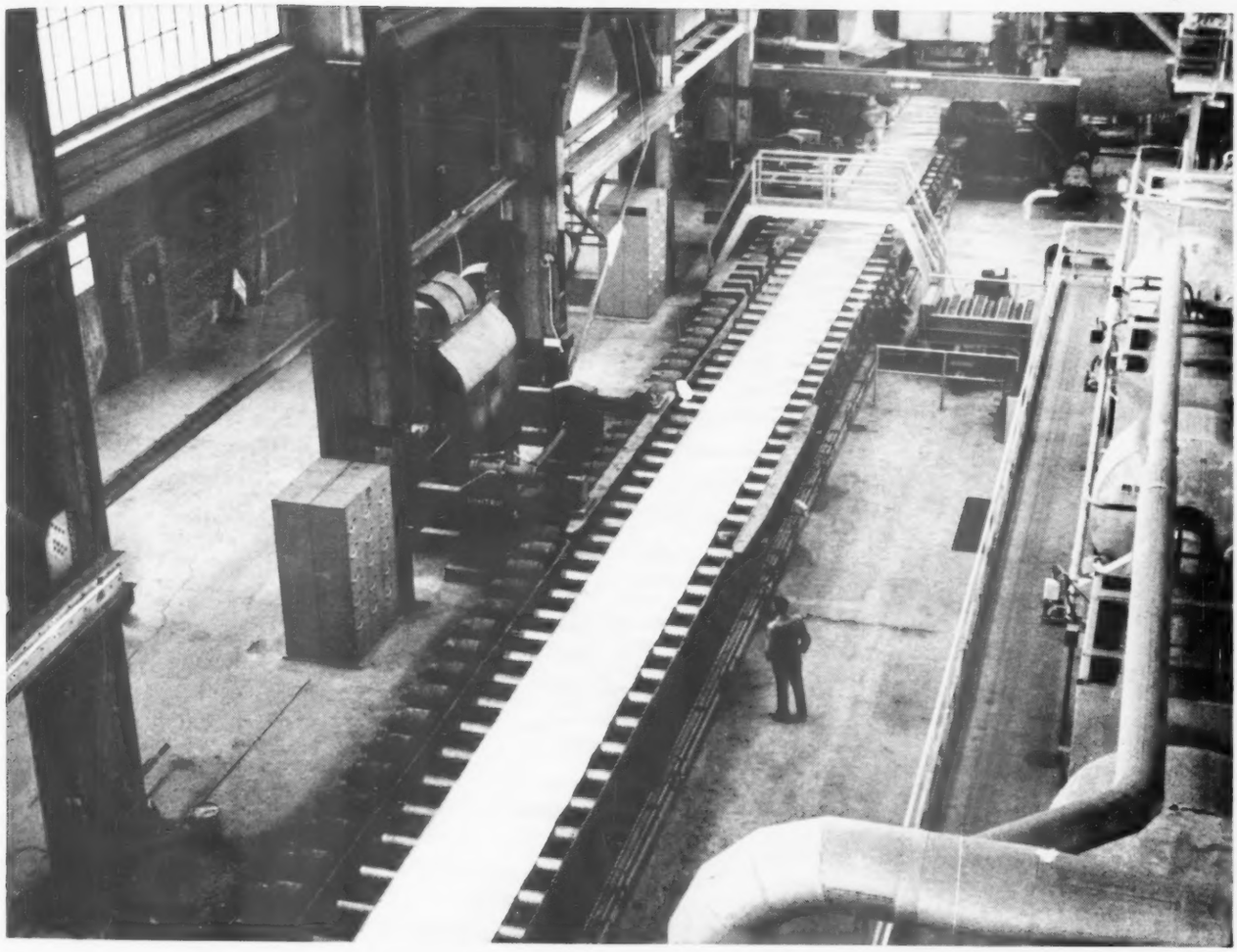
Applied Physiology Branch
Chemical Corps Medical Laboratories
Army Chemical Center, Maryland

WITH THE COMPLETION of the Climatic Facility at Army Chemical Center, Maryland, the Chemical Corps comes into possession of a unique instrument for toxicological research at any of the temperature and humidity conditions that may be encountered in military operations. This article is written to give a general description of the Facility as a matter of Chemical Corps interest and to inform potential users of its capabilities.

The Facility is housed in its own building at the Chemical Corps Medical Laboratories. It consists of a central structure containing three principal climatic chambers and the air conditioning equipment, flanked on either side by supporting laboratories. The floor plan is shown in Figure 1. The main objective governing the design was flexibility. Although some parts of the experimental program of the Facility could be planned for in detail when the design was begun in 1948, a large variety of problems will no doubt arise in the future whose exact requirements cannot be anticipated. Also, probable variations in volume of work and number of staff made it necessary to provide for intense activity at peak loads in an installation that could be kept in operation by a minimum number of research workers and maintenance personnel in slack periods.

The new Facility will employ self-contained mobile units of a new design in contrast to the fixed exposure chambers used previously in studies of chemical warfare agents and military chemicals. They consist of a source of agent, a duct for exposures, a filter for removing the toxic material after it has moved past the animal in the exposure duct, and a fan to draw air from the climatic chamber through the system. The exhaust from the unit may be dumped back into the chamber or passed out through a special vent. This feature necessitates the provision of an amount of make-up air much greater than is required in the usual low temperature test chamber. Make-up air in carefully regulated amounts up to 1[illegible] cubic feet per minute can be taken in from outdoors and brought to the temperature of the air in the climatic chamber to meet the needs of the mobile exposure units. Air is removed from the climatic chambers through a system capable of exhausting six times the volume of air circulating through the chambers. In an emergency, doors can be opened to supply this increased volume suddenly at external ambient temperature for rapid purging. These systems for supplying make-up air and for emergency exhaust are available for use in both the toxic chamber, room 18, and the all-weather chamber, room 17. The plan of operation with toxic material is to roll a mobile exposure unit into one of the climatic chambers for a test and then remove it to room 21 or 22 for decontamination or preparation for the next test. The details of these mobile exposure units vary with the application. Room air can be drawn across the animal at flow rates which can be precisely regulated between 1 and 20 miles per hour to simulate that aspect of open field conditions. Any of the agent that evaporates is picked up in the canister below. A dynamic unit built for body exposure of animals up to 5 kg. in weight is shown in Figure 2 in place

DOW



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As a result of Dow research, powerful electrolytic cells continue to extract magnesium from an unlimited source of raw material—sea water. This, plus the expanded production facilities, insures an adequate future supply of magnesium, even for the many new applications being developed. THE DOW CHEMICAL COMPANY, Midland, Michigan.

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THE CLIMATIC FACILITY OF THE CHEMICAL CORPS MEDICAL LABORATORIES

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Applied Physiology Branch
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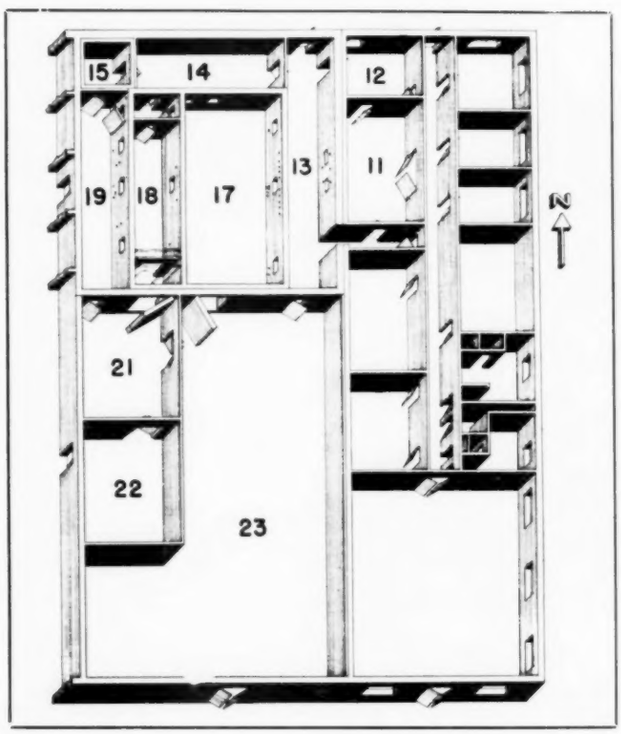
Army Chemical Center, Maryland



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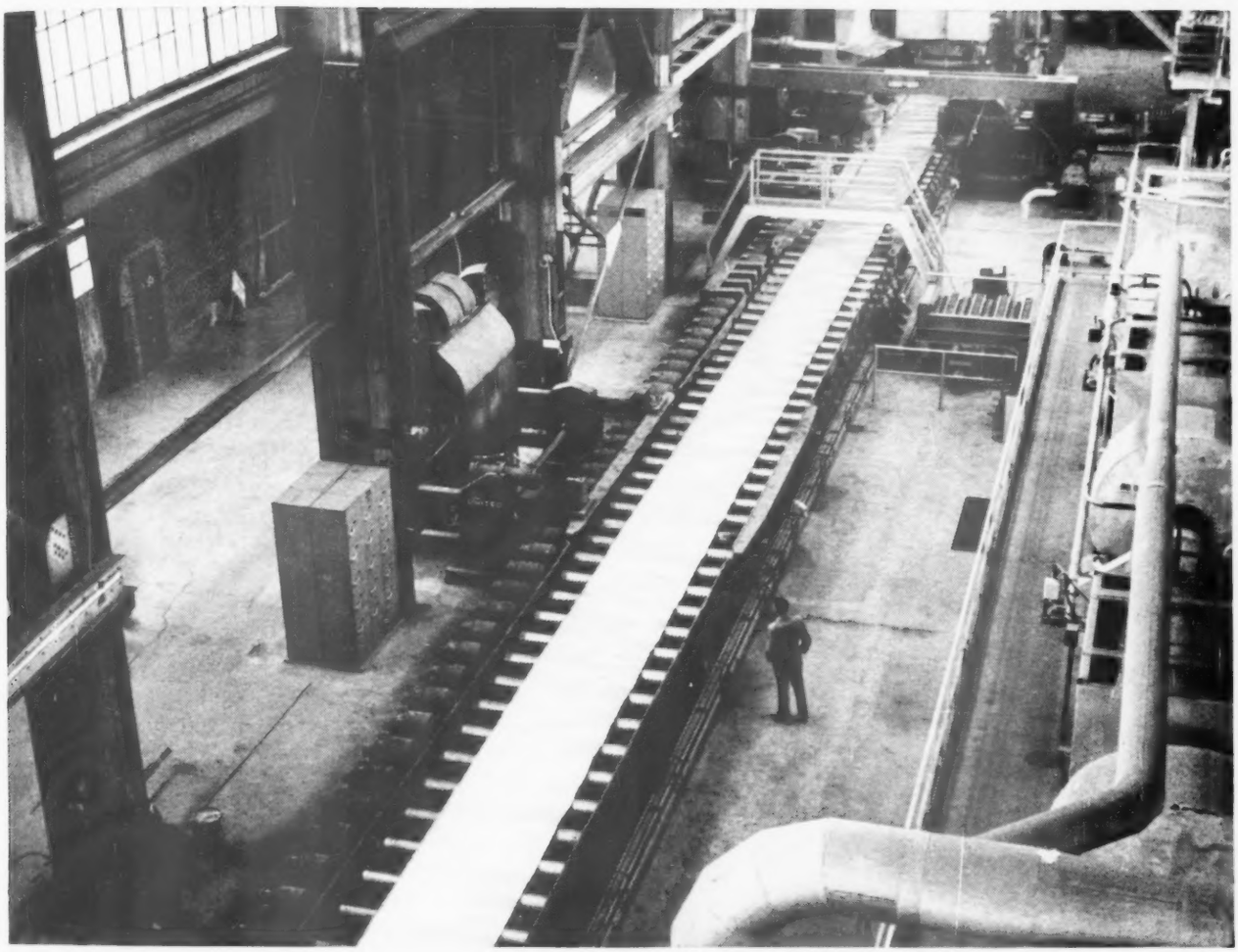

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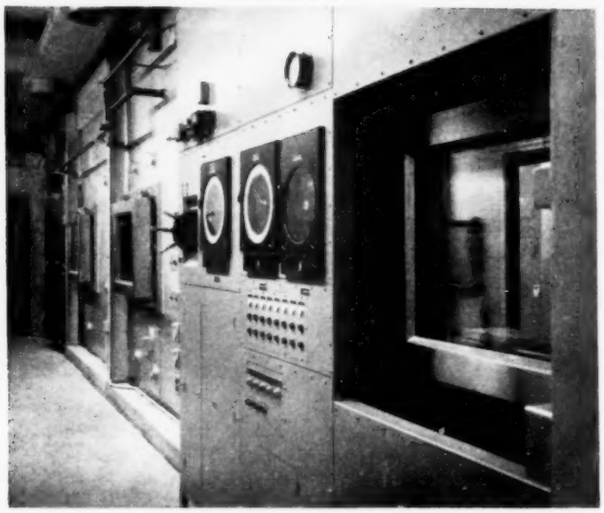

Figure 3. Observation corridor for the toxic chamber, showing penetrations through the wall for leads, and construction of the observation windows.

in the toxic chamber. The toxic chamber is designed primarily for work with these units, but the other two climatic chambers can be used when needed.

The toxic chamber has a space 32 feet long, 9 feet wide, and 8 feet high. Its temperature range is from minus 70° to plus 100° F. The dry bulb temperature has been held within 1° F for 72 hours at a time over a wide range of operating conditions in both the toxic chamber and the all-weather chamber. A large temperature gradient can be maintained between the two chambers and independent controls are provided so that operations in one room need not be tied closely to operations in the other. High humidities are easily obtained over the whole temperature range. The large refrigerating capacity of the system makes possible a substantial dehumidification of the entering air. This is particularly important at low temperatures where the absolute water content of saturated air is small because it prevents the formation of a cloud of ice crystals from moisture in expired air or air entering when doors are opened. In other chambers where this precaution has not been taken, the gas mask canister has become clogged. The regulation of relative humidity in the higher temperature ranges where there is enough moisture in the air to regulate, is quite precise. For example, at 0° F the relative humidity has been held at 58 per cent ± 1.5 per cent; at 40° F, 7 per cent ± 1 per cent and at 83° F, 97 per cent ± 1 per cent. When more detailed tests have been run it is expected that evidence will be obtained of even less variation. Figure 3 shows the observation corridor, room 19. The permanently mounted instruments are for recording and controlling conditions of temperature, humidity, and air flow in the toxic chamber.

The all-weather chamber is 38 feet long, 19 feet wide, and 15 feet high, and has the same temperature and humidity range as the toxic chamber. Since temperature is regulated by air conditioning alone, special measures will have to be taken to obtain minimal air-to-wall temperature gradients. Water can be introduced into the chamber in various amounts to simulate rain from a light mist to a heavy downpour. An important feature of the rain-making system is the control of the water temperature. This makes it possible to precipitate the water at the temperature of the chamber or at a higher or lower temperature. Fog can be produced with steam and compressed air atomization of the water from the rain system. Limited quantities of powder snow can be produced over certain areas of the chamber in particle size from 0.01 to 0.002 inches in diameter. About one-half of the floor space is taken up by a wind-tunnel in which air movement up to 45 miles an hour can be produced. A two-man treadmill is located under the wind-tunnel. Its walking surface is in effect part of the floor of the wind-tunnel. The range of belt speed is from 1 to 12 miles per hour; the treadmill can be rotated in the horizontal plane, or inclined for grade walking. This system is designed for tests on the gas mask or other protective gear to evaluate some of their protective characteristics as well as limitations imposed by the gear on the functional capacity of the soldier. In addition to work of this sort with human volunteers, toxicological studies can be conducted in the all-weather chamber and free floor space, clearances and entrance ways are sufficient to admit pieces of heavy equipment for test if this should be necesary. Also the doors and machinery in room 23 are aligned to give a free field of fire if there should be occasion to discharge a missile weapon.

Temperature and humidity conditions found in hot-dry or hot-wet climates can be produced in the hot chamber, room 11, a room 24 feet long, 15 feet wide and 10 feet high. Dry bulb temperatures will vary between plus 70° and plus 140° F. Relative humidities of from 5 to 98 per cent can be provided over most of this range. The hot chamber has a treadmill for human performance tests and is equipped for toxicological work. An observation corridor, room 13, lies between the hot chamber and the all-weather chamber, so that the same set of physiological recording instruments can be used in either chamber. Both chambers have ready access to a shower and toilet room, room 12, and a clothing storage and conditioning room, room 14. In the latter, temperature and humidity will be held constant so that damp clothing can be dried and brought to a uniform moisture content.

A number of special features are as follows: Access to the three cold chambers is obtained through doors covered with stainless steel. In the door frames, electrically heated and thermostatically controlled cables are installed to prevent the accumulation of frost and subsequent freezing. The observation windows are each composed of two multi-pane units. The inner unit is fixed in the chamber wall, while the outer unit is mounted in a gasketed, hinged door to provide access to the space between the two units. A tray containing a drying agent is placed in this space to remove all traces of moisture. This type of window construction not only provides clear visibility, but has also proven itself in other installations by eliminating the cracking which has been experienced with single multi-pane units with equal heat transfer coefficients. A number of inserts of materials of low heat conductance were built into the walls of the chambers. These penetrations permit the various leads to pass from the human subjects or experimental animals in the chambers to the recorders and monitoring devices located in the observation corridors. These leads make it possible to follow remotely the physiological state of the subject as measured by such things as the breathing, the heart rate, the oxygen consumption and body temperatures.

The heating system under the floor of the cold chambers is another important design feature. The whole structure is supported by a concrete slab resting on the ground with a layer of insulation between the slab and the floor. The upper four inches of the slab was poured over a grid of "U" shaped pipe lines whose open ends terminate in valves in a trench in the machine room. A liquid with low freezing point is pumped through these pipes to heat the slab, and any of the separate lines can be closed off if a leak should ever develop.

Heating the floor of a cold room may seem a step in the wrong direction, but is an absolute necessity when the

(Continued on page 33)

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Aerial view of the new $7,000,000 Women's Army Corps Center showing WAC school buildings, barracks, and officers quarters.

Maj. Gen. William M. Creasy, Chief Chemical Officer received by Lt. Col. Eleanore C. Sullivan, Commander, WAC Center at Ft. McClellan, during his visit to the Post last summer.

WAC Band at Women Soldiers' Training Center at Ft. McClellan plays for drills and ceremonies.

WOMEN SOLDIERS

New $7,000,000 WAC Training Center now established at Ft. McClellan, Ala. Commandant is a member of A.F.C.A.

WAC CENTER, Fort McClellan, Ala.—It is not for nothing that the Headquarters of The Chemical Corps Training Command is located in the South. Southern chivalry prevailed immediately, suh! when it was announced that the home of The Women's Army Corps Center would also be moved to Fort McClellan, Alabama.

Since the arrival late in May 1954 of the first advance party of women soldiers, The Chemical Corps Training Command has been sharing the facilities—and the honors of Fort McClellan with The Women's Army Corps Center.

A number of WAC officers, including Lt. Colonel Eleanore C. Sullivan, Commander of The WAC Center, are active members of the Ft. McClellan Chapter of the Armed Forces Chemical Association and several chemical officers from the Training Command assist in instructing at The WAC Center. WAC training curricula include a strong CBR section.

Colonel Sullivan, a former College Dean of Girls, is from Lawrence, Mass. She has an A.B. degree from Boston University and an A.M. degree from Radcliffe. She has held every position in the WAC chain of command from platoon officer through company commander, battalion commander, regimental commander and assistant Center Commandant, to Commandant. She has also served as WAC Staff Adviser for the First Army and has filled assignments with the occupation forces in Japan and with the Department of the Army.

The present population of The WAC Center, built at a cost of $7,000,000, is 1,500, but the buildings could accommodate a much larger number in case of a national emergency. The 22 cream-colored buildings are of modern architectural style. The concrete blocks used in the construction lend a look of permanency that is encouraging to the WACS who have waited twelve years for a "home of our own." Meanwhile, the Center has operated in seven temporary locations, the last having been at Fort Lee, Virginia.

Buildings include a WAC Center Headquarters; two schools—The Basic School and The WAC School; enlisted women's barracks and officers' quarters; three consolidated dining halls, a WAC clothing store and service club. All buildings have built-in circulation fans and natural gas heating.

Permanently assigned enlisted women live in semi-private cubicles or in individual rooms and they, as well as occupants of officers quarters, may exercise their tastes freely in adding to Army furnishings. A "date" room on the first floor where men friends may be met in addition to the dayroom which serves as a living room for the girls themselves, and kitchens on each floor for preparing light snacks combine to give a dormitory-like atmosphere to the barracks. Also located on each floor is a laundry room with automatic washing machines and a drying room.

The Library, theaters, swimming pools, athletic fields, chapels, and other facilities of the post are available to the WACS.

Basic training is given at platoon level. It consumes ten weeks—eight weeks of actual training preceded by one week of "filling" the platoon and one week of such pre-

cessing as interviews, aptitude tests, initial immunization shots, etc.

Actual training begins and ends with impressive orientation and graduation programs. Music is furnished by the WAC Band. Talks are given by the Center Commander, and the battalion and company officers. At the graduation, certificates are presented to all and formal recognition is given to at least one outstanding trainee.

Training consists of close order drill, marching and parades, classroom instruction in military customs and courtesies, organization of the Army, map reading—in brief, all that is included in basic training for men, with the exception of training for combat. In addition, WAC trainees are given instruction in social concepts and personal grooming.

Assignment orders are usually ready for graduates when they receive their certificates. A few are assigned to jobs on the Center or at other posts in the United States, but the majority are sent to Army schools for specialist training. Aptitudes as revealed by tests and individual preferences are considered in making assignments. At present the medical field is the popular preference and a large number are sent to medical technician school at Fort Sam Houston, Texas. The Finance School and other schools receive their quota. To meet the Army's continuous need for clerk-typists and stenographers, approximately 50 graduates from each class are enrolled in the Clerical Procedures and Typing Course, which is the only course for enlisted women given at The WAC School.

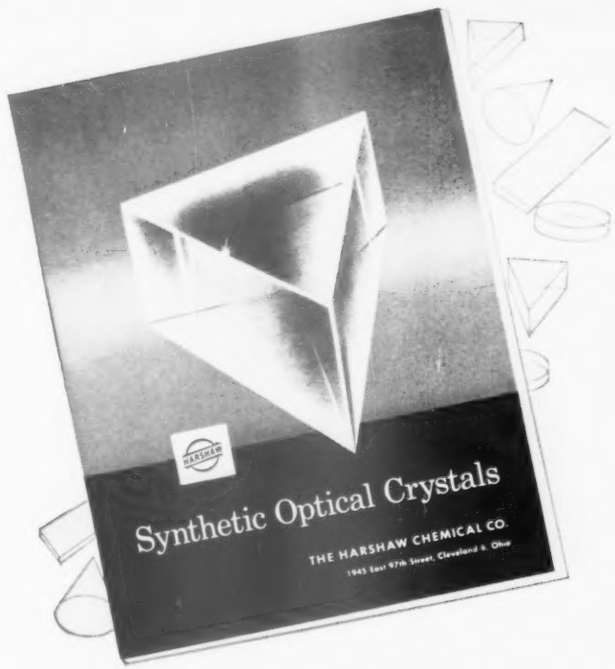
Those who aspire to attend the officer candidate course will be given temporary assignments at The Center while they await board decisions on their applications.

Officer training conducted by The WAC School includes two courses, the WAC Officers Basic Course and the Officer Candidate Course, which are planned to supply the Corps' need for new officers; and a third course, The WAC Officers Advanced Course which is designed to train captains and majors for staff positions in high echelons throughout the Army.

Offered twice a year, the 20-week Officers Basic Course is an orientation course for women who have received direct commissions in the Reserve, as lieutenants. Basic military subjects and the duties of an officer are taught; and three weeks are spent on duty assignments with the WAC Center units or at nearby Army posts. Applicants must have a bachelor's degree or equivalent business or professional experience, and those who complete the course satisfactorily must remain on active duty two or three years. At the end of their first tour they may remain in the WAC or return to civilian life, retaining their Reserve commissions.

The Officer Candidate Course is given exclusively to members of the WAC who have been approved for training toward commissioned service. Like the Basic Officer Course, the 17-week Officer Candidate Course includes three weeks of training in practical assignments.

The Advanced Officers Course was given for the first time at Fort Lee during the first seven months of 1954. The second session started at Ft. McClellan in January. Many of the officers chosen to attend the Advanced Course have already had outstanding careers in the WAC. It is expected that representatives of the Chemical Corps Training Command will assist in instructing in this course.



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  - Potassium Iodide, Activated with Thallium Iodide
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Aerial view of the new $7,000,000 Women's Army Corps Center showing WAC school buildings, barracks, and officers quarters.

Maj. Gen. William M. Creasy, Chief Chemical Officer received by Lt. Col. Eleanore C. Sullivan, Commander, WAC Center at Ft. McClellan, during his visit to the Post last summer.

WAC Band at Women Soldiers' Training Center at Ft. McClellan plays for drills and ceremonies.

WOMEN SOLDIERS

New $7,000,000 WAC Training Center now established at Ft. McClellan, Ala. Commandant is a member of A.F.C.A.

WAC CENTER, Fort McClellan, Ala.—It is not for nothing that the Headquarters of The Chemical Corps Training Command is located in the South. Southern chivalry prevailed immediately, suh! when it was announced that the home of The Women's Army Corps Center would also be moved to Fort McClellan, Alabama.

Since the arrival late in May 1954 of the first advance party of women soldiers, The Chemical Corps Training Command has been sharing the facilities—and the honors of Fort McClellan with The Women's Army Corps Center.

A number of WAC officers, including Lt. Colonel Eleanore C. Sullivan, Commander of The WAC Center, are active members of the Ft. McClellan Chapter of the Armed Forces Chemical Association and several chemical officers from the Training Command assist in instructing at The WAC Center. WAC training curricula include a strong CBR section.

Colonel Sullivan, a former College Dean of Girls, is from Lawrence, Mass. She has an A.B. degree from Boston University and an A.M. degree from Radcliffe. She has held every position in the WAC chain of command from platoon officer through company commander, battalion commander, regimental commander and assistant Center Commandant, to Commandant. She has also served as WAC Staff Adviser for the First Army and has filled assignments with the occupation forces in Japan and with the Department of the Army.

The present population of The WAC Center, built at a cost of $7,000,000, is 1,500, but the buildings could accommodate a much larger number in case of a national emergency. The 22 cream-colored buildings are of modern architectural style. The concrete blocks used in the construction lend a look of permanency that is encouraging to the WACS who have waited twelve years for a "home of our own." Meanwhile, the Center has operated in seven temporary locations, the last having been at Fort Lee, Virginia.

Buildings include a WAC Center Headquarters; two schools—The Basic School and The WAC School; enlisted women's barracks and officers' quarters; three consolidated dining halls, a WAC clothing store and service club. All buildings have built-in circulation fans and natural gas heating.

Permanently assigned enlisted women live in semi-private cubicles or in individual rooms and they, as well as occupants of officers quarters, may exercise their tastes freely in adding to Army furnishings. A "date" room on the first floor where men friends may be met in addition to the dayroom which serves as a living room for the girls themselves, and kitchens on each floor for preparing light snacks combine to give a dormitory-like atmosphere to the barracks. Also located on each floor is a laundry room with automatic washing machines and a drying room.

The Library, theaters, swimming pools, athletic fields, chapels, and other facilities of the post are available to the WACS.

Basic training is given at platoon level. It consumes ten weeks—eight weeks of actual training preceded by one week of "filling" the platoon and one week of such pre-

cessing as interviews, aptitude tests, initial immunization shots, etc.

Actual training begins and ends with impressive orientation and graduation programs. Music is furnished by the WAC Band. Talks are given by the Center Commander, and the battalion and company officers. At the graduation, certificates are presented to all and formal recognition is given to at least one outstanding trainee.

Training consists of close order drill, marching and parades, classroom instruction in military customs and courtesies, organization of the Army, map reading—in brief, all that is included in basic training for men, with the exception of training for combat. In addition, WAC trainees are given instruction in social concepts and personal grooming.

Assignment orders are usually ready for graduates when they receive their certificates. A few are assigned to jobs on the Center or at other posts in the United States, but the majority are sent to Army schools for specialist training. Aptitudes as revealed by tests and individual preferences are considered in making assignments. At present the medical field is the popular preference and a large number are sent to medical technician school at Fort Sam Houston, Texas. The Finance School and other schools receive their quota. To meet the Army's continuous need for clerk-typists and stenographers, approximately 50 graduates from each class are enrolled in the Clerical Procedures and Typing Course, which is the only course for enlisted women given at The WAC School.

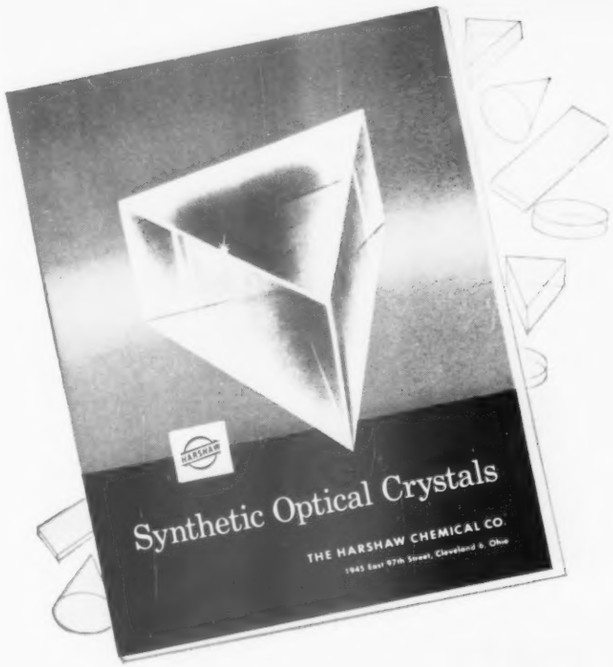
Those who aspire to attend the officer candidate course will be given temporary assignments at The Center while they await board decisions on their applications.

Officer training conducted by The WAC School includes two courses, the WAC Officers Basic Course and the Officer Candidate Course, which are planned to supply the Corps' need for new officers; and a third course, The WAC Officers Advanced Course which is designed to train captains and majors for staff positions in high echelons throughout the Army.

Offered twice a year, the 20-week Officers Basic Course is an orientation course for women who have received direct commissions in the Reserve, as lieutenants. Basic military subjects and the duties of an officer are taught; and three weeks are spent on duty assignments with the WAC Center units or at nearby Army posts. Applicants must have a bachelor's degree or equivalent business or professional experience, and those who complete the course satisfactorily must remain on active duty two or three years. At the end of their first tour they may remain in the WAC or return to civilian life, retaining their Reserve commissions.

The Officer Candidate Course is given exclusively to members of the WAC who have been approved for training toward commissioned service. Like the Basic Officer Course, the 17-week Officer Candidate Course includes three weeks of training in practical assignments.

The Advanced Officers Course was given for the first time at Fort Lee during the first seven months of 1954. The second session started at Ft. McClellan in January. Many of the officers chosen to attend the Advanced Course have already had outstanding careers in the WAC. It is expected that representatives of the Chemical Corps Training Command will assist in instructing in this course.



the latest information on

SYNTHETIC OPTICAL CRYSTALS

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UNITED STATES

ABOVE:

Top:

FT. SILL, OKLAHOMA—Chemical smoke grenades screen men of the 522nd Infantry Battalion (Sep) in attack demonstration at the Army Aviation School in which Army aircraft flew close support missions.

Center:

CAMP POLK, LOUISIANA—37th Infantry Division plane being prepared for a smoke screen mission in chemical demonstration.

Bottom:

CAMP IRWIN, CALIFORNIA—Students at Flame Thrower School, Armored Combat Training Center, firing mechanized flame thrower (napalm fuel) for maximum range.

MILITARY CHEMISTRY

U.S. Army photos

UNITED STATES

BELOW:

Top:

CAMP CARSON, COLORADO—Sfc. Charles F. Extrom, 8th Reconnaissance Company, demonstrates portable flame thrower at Chemical Corps Flame Thrower School.

Center:

YUMA, ARIZONA—Members of the Yuma Lions Club during a tour of the Yuma Test Station watch demonstration of flame thrower in action at the Chemical Storage Area.

Bottom:

CAMP WOOD, NEW JERSEY—Tear gas bombs exploding in the roadway amid passing troops present a problem in leadership reaction test.

AT WORK AT HOME AND ABROAD

GERMANY

BELOW:

Top:

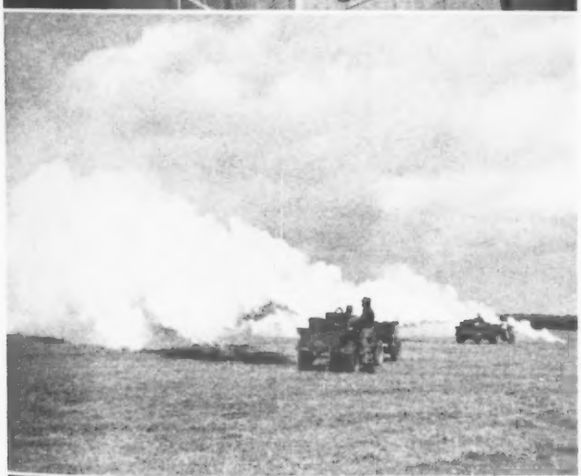
FRANKFORT—Modern chemical laboratory of 53rd Chemical Lab Unit analyzes material purchased overseas by the Army. Picture shows Maj. Chas. W. MacFarlan (at right), formerly C.O. of the lab, with his executive officer, Maj. Sterlin R. Horton, examining an oven.

Center:

MUNICH DISTRICT—4th Chemical Smoke Generator Company laying down smoke screen in chemical demonstration.

Bottom:

NURENBURG—371st Armored Infantry Battalion demonstrates use of flame thrower in assault of fortified position.



KOREA

ABOVE:

Top:

21st Chemical Decontamination Company demonstrates use of decontamination truck.

Center:

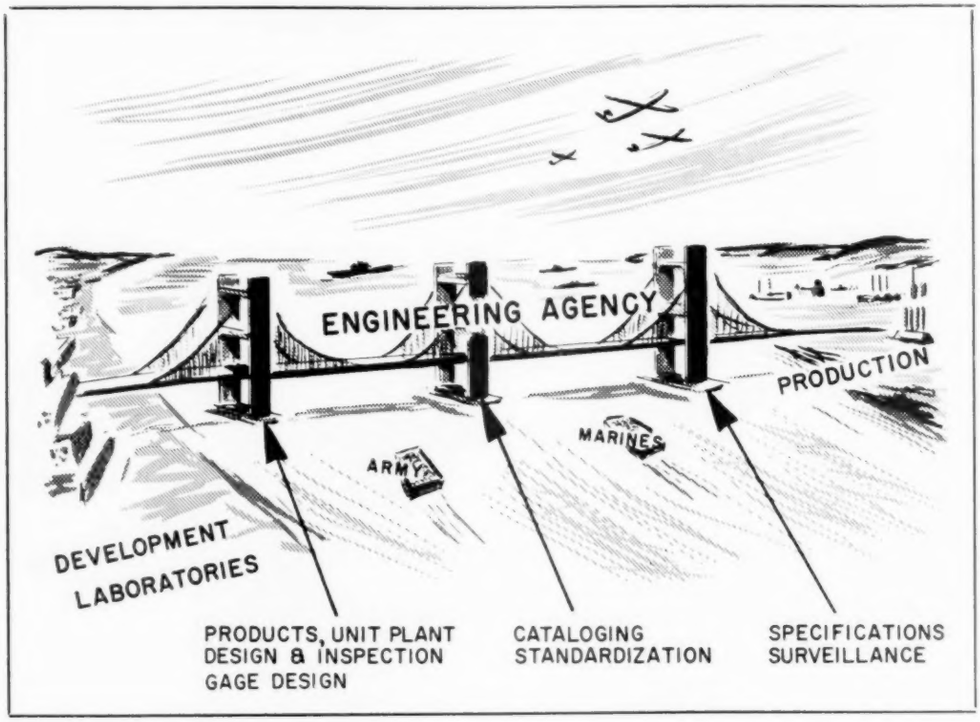
Members of Company K, 23rd Infantry, 2nd Infantry Division in training exercise set off color smoke bomb indicating their misssion accomplished.

Bottom:

Sfc. Earl R. Quitsch, chief of the Chemical Section and Sgt. Richard W. Schoonover, chemical staff specialist, 45th Infantry Division, fixing a mine.

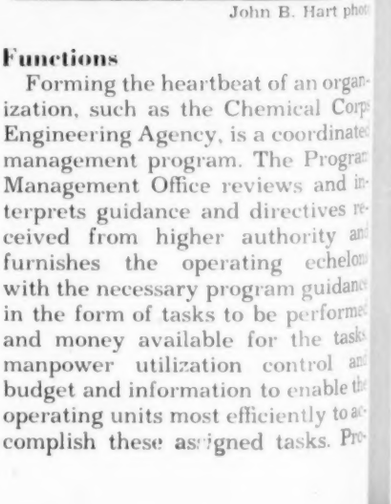
PRODUCT DEVELOPMENT FOR MASS PRODUCIBILITY

ROLE OF THE CHEMICAL CORPS ENGINEERING AGENCY



By

WILLIAM J. ALLEN, JR.
Colonel, Cml C
Commanding Officer



John B. Hart photo

Mission

THE MISSION of the Chemical Corps Engineering Agency is to engineer items and processes developed by Chemical Corps developing agencies, maintaining the ability to meet military characteristics; to prepare final designs for all Chemical Corps materiel, and provide design criteria for technical facilities, incorporating those engineering features that will insure producibility of quantities required with the maximum utilization of commercially available materials and products and the minimum use of critical materials; and to furnish technical engineering assistance on Chemical Corps materiel and plants as required.

Liaison

Streamlined and organized for fast and efficient action in carrying out its mission of product development from an engineering point of view, the Chemical Corps Engineering Agency bridges the area between the facilities of the research development laboratories and those of procurement and production. Across this bridge and through the Engineering Agency must pass the product, Chemical Corps end items, munitions, protective devices, plants and processes. They enter as experimental items and prototypes from the development laboratories designed to meet the military requirements, but not always completely engineered for economic mass production, optimum materials, maintenance, human factors, and industrial processes. While in the Engineering Agency, they are engineered with due regard to mass producibility, materials and methods of construction, functional operation, packaging and maintenance. Complete with drawings, specifications and operation directives, the item is delivered to the Chemical Corps Materiel Command, the procurement and production facility of the Corps.

Functions

Forming the heartbeat of an organization, such as the Chemical Corps Engineering Agency, is a coordinated management program. The Program Management Office reviews and interprets guidance and directives received from higher authority and furnishes the operating echelons with the necessary program guidance in the form of tasks to be performed and money available for the tasks, manpower utilization control and budget and information to enable the operating units most efficiently to accomplish these assigned tasks. Pro-

gram documentation, coordination and establishment of fiscal control is included as essential. Work simplification, organizational management, procedural analysis, manpower control and the human problems of management are accomplished as a service to the operating units as a part of the overall management program.

Within the framework of the program, the primary engineering functions and facilities of the Chemical Corps Engineering Agency, shown in the illustration as piers that support this bridge of engineering development, are those of product design, unit plant design, inspection gage design, cataloging, standardization, specifications and surveillance. Accomplishment of these functions is what is meant when it is said that the Chemical Corps Engineering Agency "engineers" an item or process for production. Engineers concerned with products design, unit plant design, and gage design make analyses and evaluations for maximum interchangeability of parts, maximum use of commercially available materials and components, and the elimination of critical and strategic materials. Checks are made to insure that assembly line methods can be used in manufacture, determination of tolerances that can be reasonably maintained, and dimensioning of various components for standard tools and dies.

The Agency's function in the finalization of Chemical Corps drawings and specifications for procurement purposes is not limited to the use of these documents by the Chemical Corps alone. The specifications prepared in final form cover the Department of Army and Department of Defense Program of Standardization. The Agency represents the Department of Defense in the preparation and maintenance of those specifications or standards on items or materials for which the Chemical Corps has custodianship. By definition, the specification is a "clear and accurate description of the technical requirements for a material, a product, or service, including the procedure by which it will be determined that the requirements have been met." These documents establish engineering and technical limitations and applications of materials, processes, methods, designs, drafting room and other engineering practices or any related criteria deemed essential to achieve the highest practical degree of uniformity in materials or products, or interchangeability of parts used in these products.

Finalized drawings used for procurement purposes in manufacturing may supplement the specification or, in many cases, will stand alone as a procurement document. It is, therefore, necessary that these drawings conform to the uniform military standards and the simplification for manufacture and interchangeability be included in the design represented. The types of materials, their fabrication, their ease of manufacture, dimensioning for gaging points, and critical assemblies are included before the drawings are released for procurement purposes. The work is coordinated with the Federal Catalog Program to get nomenclature and stock numbers and to eliminate duplication of items for which other services have the responsibility for procurement. Military standards are incorporated either in the drawing or its Bill of Material so that the maximum uniformity is obtained within the military establishment which is reflected in interchangeability, simplification, and standardization without jeopardizing the military characteristics or research program. These documents, in conjunction with the specification, are coordinated with industry and reflect the latest manufacturing and development.

The cataloging and standardization groups identify the various components of the item so that persons in all branches of the military service will know them by the same name and number. This is done through the medium of Chemical Corps catalogs which is a division of the Army of the Department of Defense Catalog System. These catalogs contain the nomenclature, stock numbers and other pertinent information necessary for initial and subsequent requisitioning of an item and its spare parts, in accordance with pertinent tables of allowance. Through this standard catalog system, for example, a person in the Navy who has used certain Chemical Corps equipment in Korea may go to an Army base in the Philippines, ask for a component of the equipment by the same name and stock number, and be certain of receiving the correct part. Technical equipment manuals, which instruct the user in the field on the proper operation, care and maintenance of equipment, are prepared by these groups.

After the item leaves the producer's plant and goes to the depot, it is extremely important that materials be kept to a quality that will assure their readiness for the user on a moment's notice. Technical criteria for surveillance as prepared by the Agency for the guidance of those in the depot actually performing surveillance, show a close relationship to the specifications. These criteria are coordinated with interested activities in order that the quality of materials is maintained without unduly affecting their usefulness, and that the technical criteria do not impose expensive procedures to maintain material in a Class A condition. The surveillance program serves to eliminate unusable material before it is released to the field, assures issuance to the soldier of the best material with which to perform his mission, and furnishes a guide to the research and development program to improve or correct similar or related problems on new items.

Cooperation and Coordination

In order to expedite the engineering development and mass producibility from adequate drawings and specifications of the original research prototype, an intimate and close liaison is maintained between the Engineering Agency, the development laboratories and the production organization of the Chemical Corps. While the project is still in the development stage, an Engineering Agency associate project engineer maintains contact with the development project engineer and advises him in such a way as to insure incorporation of a maximum of engineering and standardization during development of the item or process so that later required engineering modifications will be at a minimum. When development is completed and the experimental item is transferred to the Chemical Corps Engineering Agency, the representative of the Agency (the assistant project engineer) becomes the project engineer and the former development project engineer now becomes an associate project engineer for development laboratory liaison to advise as to the effect of engineering modifications on functionability of the item or process. At this same time, the Chemical Corps Materiel Command (MATCOM) is invited to assign an associate project engineer to act as liaison in the interests of that production and procurement facility. When the item becomes finalized and standardized by Chemical Corps Technical Committee action and the item transferred to the custody of MATCOM, their engineer becomes the project engineer, with representatives of the development laboratories and the Chemical Corps Engineering Agency serving as

(Continued on page 29)

SCIENCE AND NATIONAL POWER

(Continued from page 14)

than that—the Chinese too—to get enough production to carry on a protracted world war. And I don't care what their manpower is. You would just have to wring it out of the economy, that is, the civil economy, the supporting economy. This is Russia's greatest weakness.

What is the element of progress? Are we gaining or losing? This is merely a chart of today. It is true that Russia is gaining on us. We still have a little time—not too much, but we have it.

Chart 10.—This chart shows energy output by sources from 1850 to date. Here you see the human worker, work animal, the wind, and water. It is pretty clear that the total waterpower of the world is no basis for civilization.

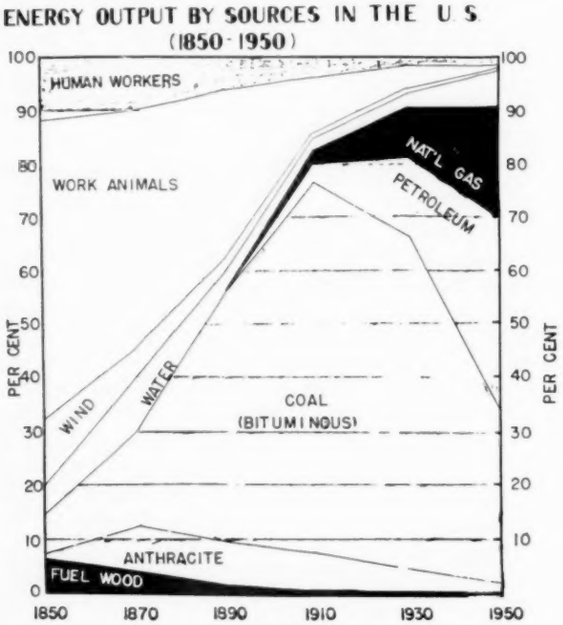


Chart 10

Look at what happens to bituminous coal. Look at petroleum and natural gas. Look at the ratio of them to technology and science. That chart is interesting merely to show the effect of the new technology on your energy sources.

Chart 11.—In this chart gross national product is shown for us and the Soviet bloc. Total West 1,136 and Soviet bloc 222. This is merely another way of interpreting how we use energy. What is the end product of the use of energy in these two economies? The title shows it, gross

GROSS NATIONAL PRODUCT
1953
(U S DOLLARS)

	POPULATION (MILLION)	GNP (BILLION)	GNP PER CAPITA (DOLLARS)
UNITED STATES	160	360	2255
WESTERN EUROPE	332	191	577
CANADA	15	24	1581
TOTAL WEST	507	575	1136
USSR	211	106	502
EUROPEAN SATELLITES	95	40	421
COMMUNIST CHINA	475	28	58
TOTAL SOVIET BLOC	781	174	222

Chart 11

national product. I would suggest that you study this chart a little bit. Break down the effect of these figures on the Soviet Union and its satellites and on us and our allies and then pose yourself this question: What will happen if we make enemies of some of our present allies? You will find it gets pretty serious. Just start shifting these blocks around. Imagine that Russia has the capacity to overrun western Europe and we lose our friends. See how this ratio changes. But that is a military analysis, which I am not trying to talk about here.

Chart 12.—What does it take besides energy to advance technologically? It takes men of science and men of engineering—scientists to broaden the horizons and engineers

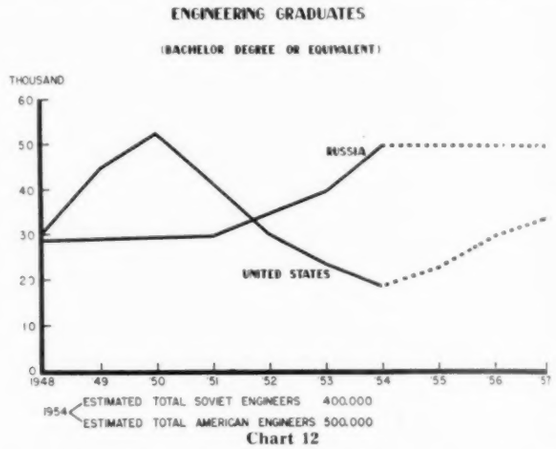


Chart 12

to put their results to work. What is going on? The figures shown give recent information. I cannot support the estimates for the future at all. I don't think anything ever happens on a flat line, it is just an expression of ignorance.

There is in Russia a mechanism called a "teknakon," which is not to be found in the United States. There are 35 or 36 teknakons in Russia and they are in a twilight zone between an engineering baccalaureate curriculum and a technical high school. They are much better than our technical high schools, reaching up toward our baccalaureate engineering courses.

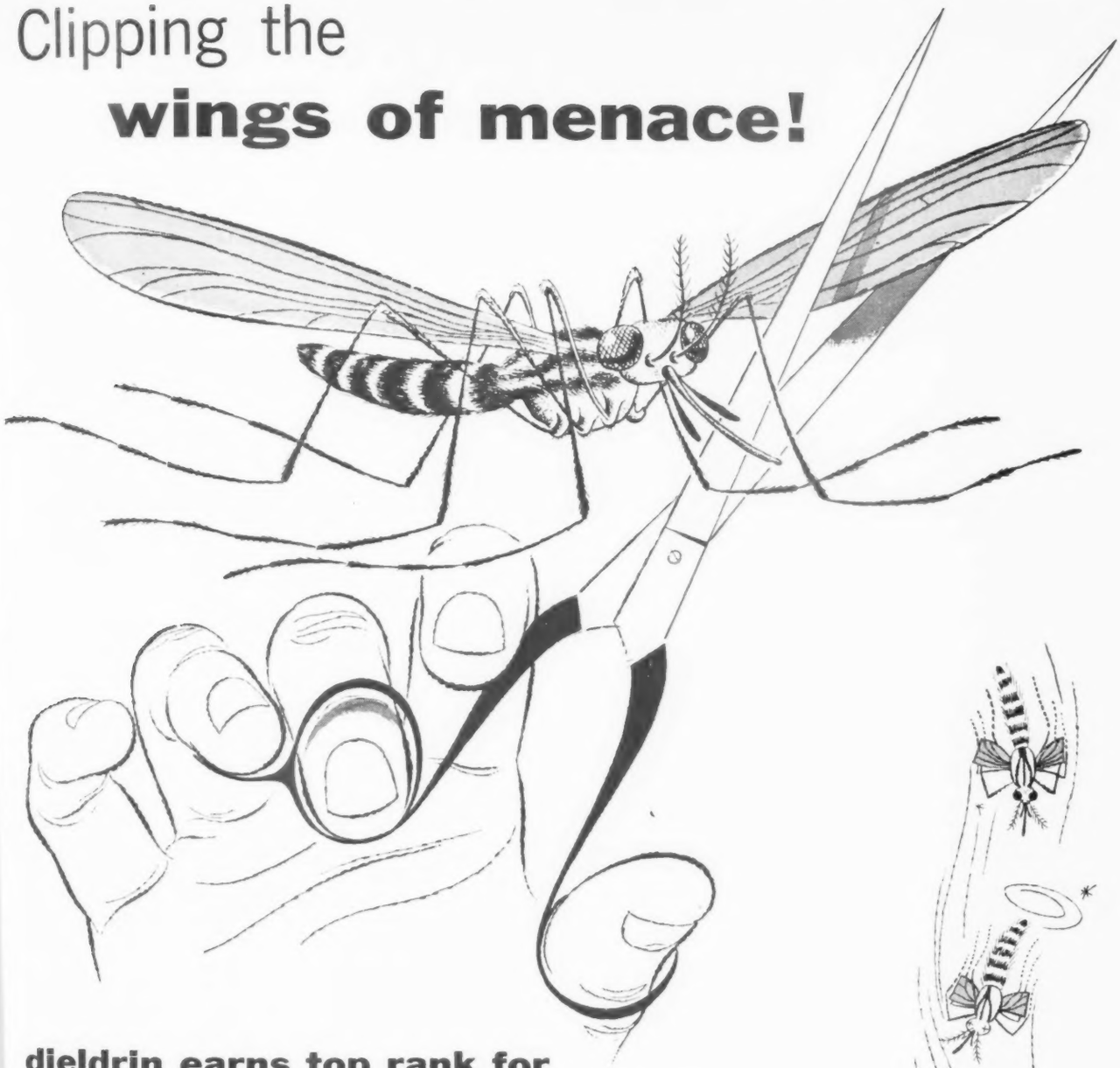
Those teknakon figures have not found their way into this chart for it is not being done that way here. The Russian curve, relative to ours, is frightening. It even goes so far as to hint that as early as 1959 we could be licked. Russia indicates it will have a bigger well of manpower than the United States in the scientific and technical fields.

I will not necessarily hold to that; but I will say it is something for you to be, like myself, somewhat frightened about. You do see the trend of the Russian and the trend of our engineers. And it is not good.

You have to realize that the figures give the number of graduates per year. You must take into account also the well of graduates that exists. We do have today far more graduates than Russia has, because she was just coming up when we were already up. She also started late, a part of Uncle Joe's work. It is interesting to note that Malenkov is an engineer and Krushchev is an engineer. The top men of the Russian Government are engineers. They know the importance of engineering and science in this struggle. Were they lawyers, as most of our top people are, were they professional educators, were they businessmen, what would have happened? That is a question. But they are not. These men are engineers. And in Russia they can tell what students are going to become engineers. They do not leave it to the whimsey of educational advisers, parental prejudices, childish ignorance.

(Continued on page 28)

Clipping the **wings of menace!**



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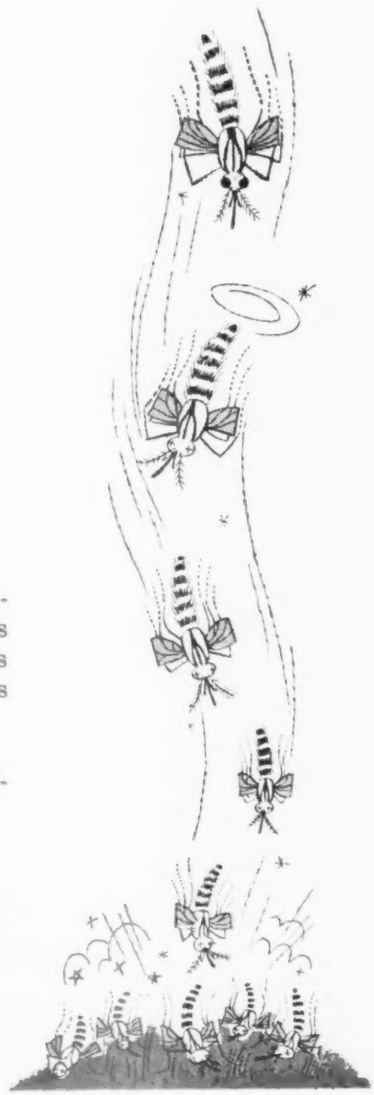

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I don't know how to combat this trend. I have no prescription for it. It is a problem I will leave to you gentlemen.

Well, that is what we are talking about in a sense. Are we gaining or losing relative to Russia in terms of war potential? I will try now to construct my formula for war potential. What is it? You know already that total combat troops, airmen, sailors, are not the answer. Also the total excellence of weapons is not the answer. Logistical supply must be coupled with it. This means we have to take the civil economy and weld it into what is now the concept of modern or total war.

In a democracy this is very difficult. Politically it is very difficult. Try to tell the laboring man he is going to go to a different town and work where there is a very urgent need. Try to tell Mr. Smith's son that he is a scientist and stays in his laboratory, while Mr. Jones' son goes into the Army and carries a rifle. What would happen? Mr. Jones would go to his Congressman and say, "Isn't my son as good as Mr. Smith's son?"

Mr. Malenkov has only Mr. Malenkov and Mr. Krushchev to think of. That is a far simpler problem. But we do have some advantages. One of them is this: It is one thing to order people into their walks of life and another thing to get the same degree of response from them as from the man who selects his walk of life, the fellow who can tell his boss where to go, and frequently does. There is a difference in the output. There is a difference in the response.

I don't propose to tell you that we can evaluate that. All we know is that it exists. This is a social science statistic. Many meanings can be put upon it, such as the inability of the Soviet to make Moslems respond to agnostic requirements. He has not assimilated his Moslems. He has spread them. He has moved them around. He has destroyed their centers of culture. Gentlemen from the sunny Crimea frequently find themselves in the icy wastes of Yakutsk.

I don't think those men respond as readily as an Indianan who moves to California. I think that this ability to live where we want to live, to do the things we want to do, is a tremendous advantage. But I don't know how to tell you to measure it. I think we had better call it our ace in the hole.

I am going to try to bring this thing to some sort of summary close, or neat little package, if I can.

One of the subtle things that now must be given some consideration, and one which I must say I have had quite a bit of experience with, is an intelligent assimilation of scientific advisers into the military echelons. This has not really been accomplished to date. But I think great progress has been made.

The scientist cannot create a new body of science by a military order. He must have a desire to do it. If he has a gripe—and they do have gripes—you must deal with him not on a military basis and not put him in the guardhouse on bread and water. You have to sell that guy. This is not part of the military tradition. You don't have to sell a noncommissioned officer on the fact that he should execute your command. But you do have to sell these scientists.

Your skill in recognizing his role and keeping him out of roles that he doesn't belong in is just as important. He is just as human as you are. He is an empire builder, too. He often likes to get over into your province; don't let him—he is inadequate there. There are rare exceptions, but usually he is inadequate. In his own field he does not work like you do.

This has all too frequently not been recognized by military people in high-policy areas. It is only people like yourselves, who come here to study this relationship, and get from it that understanding which is part of your team, who can do it. It is not only a question of devising weaponary and even weapons systems and assessing military problems, but also going out and perfecting their use. You can hand out a manual on how to use a complex radar, but you can't hand out with it the brains, the understanding, of what happens when that radar system has a limitation or a breakdown, and whether you can do something on the site or whether you have to ship it back to the factory and fight under a disadvantage. And the military commander should not try to do it. So you have to integrate these boys into your picture. This is one of your most difficult problems.

In attempting to answer the lecture scope, namely, "What is science doing to maintain the relative position of strength of the United States?" we must consider our scientific potential. You know what is meant by "using our production potential." In addition to that, and most important of all for the future, is the skill with which those factors are integrated into the military potential of our country's forces. Thus it can be assumed that this lies behind the objectives of the Industrial College, and in particular that section of the curriculum which is devoted to technological progress, to which this is merely an introduction.

COL. ADRIAN ST. JOHN

Colonel Adrian St. John, veteran chemical warfare officer of World Wars I and II, died on January 12 in Biloxi, Miss., where he had resided since retirement in 1949. Burial was at Arlington National Cemetery.

In World War II Col. St. John served in both the Far East and European theaters. Early in the period he headed a mission in Burma supervising lend-lease shipments over the Burma Road. Following return from that duty he was sent to Europe and served on the staff at Supreme Allied Headquarters. After the war he commanded the St. José tropical test station in the Panama area, and Deseret Depot and Dugway Proving Ground, Utah.

Col. St. John was commissioned in 1913 as an officer of the Vermont National Guard; later joined the New York Guard and served on the Mexican Border. As a captain, National Army, he served with the First Gas Regiment of the American Expeditionary Forces in World War I. He was commissioned in the Regular Army as a 2nd Lieut. of Cavalry in 1917 and transferred to the Chemical Warfare Service in 1920.

St. John held A.B. and Civil Engineer degrees from the University of Vermont and a Master of Arts degree from New York University. He was a graduate of the School of the Line, the Command and General Staff School and the Chemical Warfare School. He had been awarded the Legion of Merit, the Bronze Star Medal and the Army Commendation ribbon.

In addition to his widow he is survived by his son, Major Adrian St. John, Jr., now on duty overseas; two adopted sons, Richard and Robert Glover; and two sisters, Miss Celia St. John of New York and Mrs. William Mitchell of Chicago.

PRODUCT DEVELOPMENT

(Continued from page 25)

associate project engineers for liaison interest and rendering cooperative assistance from their activities. This close cooperation and coordination assures fast and efficient product flow and results in superior product at lower cost.

Specialty Engineering

While the primary function of the Chemical Corps Engineering Agency is to perform those engineering tasks which are discussed under functions above and which are necessary to adapt the design of a prototype item to quantity production, additional refinements are considered and modifications accomplished within several specialized areas of modern engineering practices. In so doing, the most modern principles and practices of Maintenance Engineering, Human Engineering, Packaging Engineering, Management Engineering, and Statistical Engineering are applied to Chemical Corps end items and processes.

Maintenance Engineering is one of the newer concepts of modern industry which is currently being applied at the Chemical Corps Engineering Agency. During the initial stages of engineering design of new Chemical Corps end items, a concerted effort is made to incorporate ease of maintenance and consideration of the maintenance man in the field into the design. Drawings, specifications and prototypes of proposed end items requiring maintenance or spare parts support are carefully reviewed to assure the use of standard parts, ruggedness of design and simplicity of maintenance to better serve the using unit in the field. In the furtherance of this objective, constant liaison is maintained between the Chemical Corps Engineering Agency and units in the field. Chemical maintenance Tables of Organization and Equipment organizations and maintenance sections of depots are contacted to determine their capabilities and limitations. A review is made of the caliber and qualifications of maintenance personnel, type of tools, equipment, and raw stock on hand, and is a determining factor in concluding the extent of local fabrication and maintenance that can be accomplished at these levels. Liaison is maintained with MATCOM and the various supply activities to determine rates of parts replacement, repetitive failures, elimination of duplicate, non-essential, non-functional, and non-standard spare parts. Liaison is also maintained with those responsible for preparation of Tables of Organization and Equipment to insure maximum correlation between spare parts lists, maintenance instructions and the TO & E's. All of this information is correlated, evaluated and applied to the areas of prime concern. Thus a sound basis for newer and better design and a guide to improved modifications of equipment (end items) currently in the system is established.

Early in World War II, it was discovered that the potentialities of modern weapons and equipment, despite their superior engineering achievements were not yielding the performance that their advanced design seemed to merit. It was recognized, too late in many instances, that the human operator remained an essential link in military tasks and procedures and that special effort would be required to design the equipment so that it was congruent with the natural capacities and abilities of the average man. The experimental psychologist was called upon to suppy his fund of knowledge and research techniques to the solution of problems that affect the desired optimal relationship between man and his equipment. The application of psychological principles to problems of

(Continued on page 34)

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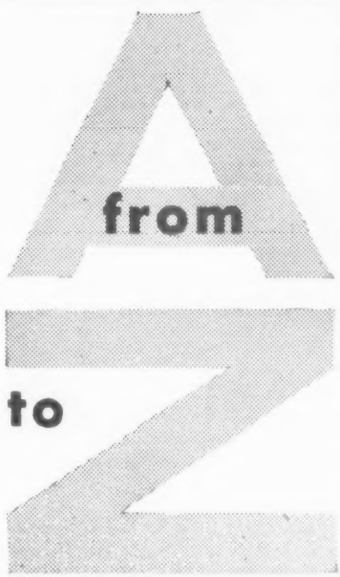

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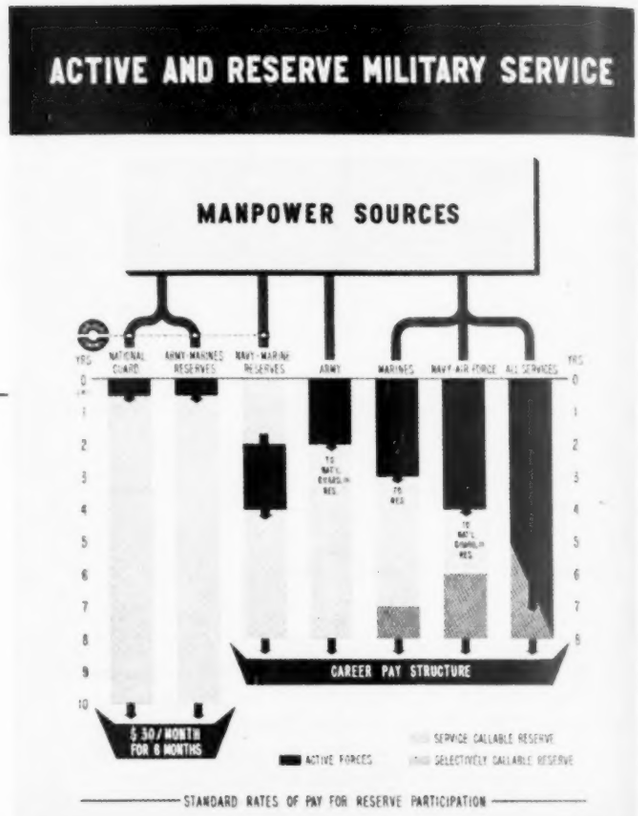
This chart was one of several used for illustration and does not include all of the details which are covered in the Service plans. The symbol to the left of the flow channels from Manpower Sources is to indicate quota control by the President through the Secretary of Defense.



NATIONAL RESERVE PLAN

THE PLAN OF THE Department of Defense for the overhaul and strengthening of the Armed Forces reserve system, known as the National Reserve Plan was announced at a press conference held by Secretary Wilson, accompanied by Assistant Secretary of Defense (Manpower and Personnel), Carter L. Burgess, on December 17, 1954. The plan is reflected in the 1955 legislative program of the Department.

In opening the conference Mr. Wilson stated that the plan is not an isolated concept but a working part of the plan for security of our Nation. Mr. Burgess, in the course of a prepared statement issued at the meeting, emphasized that the plan is for a limited period. "We simply cannot foresee," he said, "all the problems that will arise five years from now. We cannot foresee today what kind of training will be required after 1959 in view of the weapons and techniques that may be developed in the interim. . . . Therefore, this plan is designed only for the next four years. . . . We are not committing the Nation to a long-range military program."

The following summary is based on the presentation by Mr. Burgess:

Provisions in General

The plan provides for reenacting existing law (which will expire in June) fixing the term of military obligation at 8 years for every young man who enters the military service. This 8-year service provision applies to officers and volunteer enlisted men as well as inductees. The inductee who serves two years on active duty still has 6 remaining years of reserve duty. The plan provides for continuation of the draft but includes incentives for voluntary enlistment. Perhaps the most noteworthy feature of the plan is a limited provision for young men under 19 years of age to volunteer for six months of military training on a full-time basis; thereafter to remain in the reserve, subject to call, to complete a total obligation of 10 years. Still another new provision is that which would enable men to enlist directly in the reserve subject to call to active duty within two years of initial enlistment for at least 24 months of active service. Both of these provisions would be subject to quota control by the President.

Reserve Categories

The two present categories of reservists—the Ready Reserve and the Stand-by Reserve—are continued in the plan under the titles, respectively, "Service Callable Reserve" and "Selectively Callable Reserve." However, the new plan differs from present procedures by stiffening and strengthening reserve training requirements through a definite system of incentives and penalties. In addition, the new plan, if carried out, will in time bring about a change in the character of the Ready Reserve from a group consisting largely of men who have performed active service, to a group which includes a large proportion of trained nonveterans. In this connection Mr. Burgess's statement referred to the report of the National Security Training Commission which pointed out inequities in the present reserve system under which the initial burden of a new emergency tends to fall upon men who have already rendered considerable service as was the case at the outset of Korea.

Ready Reserve

The new Ready Reserve, technically called the "Service Callable Reserve," appropriately organized and trained would constitute the reserve manpower base for the initial phases of a general mobilization. It would be a readily available force subject to call in war or in an emergency declared by Congress or proclaimed by the President.

a. *National Guard*—The National Guard would be part of the "Service Callable Reserve," would retain

its traditional position as part of the first line of defense of the Nation, and continue in its present structure, having both State and Federal status. (States would be authorized to raise militia for state employment whenever the National Guard were engaged in Federal service.)

b. *Screening*—A continuous process of screening would be applied to the "Service Callable Reserve," to insure proper balance of military skills within established strengths and also insure that individuals possessing critical civilian skills would not be retained in numbers beyond military requirements.

There are three ways in which men would enter this reserve category, viz.,

a. At the end of a period of voluntary enlistment in the Regular establishment to complete the 8-year service obligation.

b. By direct enlistment in the Ready Reserve.

c. Under the 6-months full-time training plan, after completion of that training.

Stand-By Reserve

The "Stand-by" or "Selectively Callable Reserve," would be composed of personnel who have fulfilled their "Service Callable Reserve" obligation or who have been transferred to the Stand-by group as a result of the screening process. Members of this reserve group would be liable for recall only in a general mobilization and their availability for service would be determined by the Selective Service System "based on allocation of critical skills between military service and essential civilian activities." It is provided that combat veterans of Korea or any other conflict would be given first consideration for transfer to the Stand-by or Selectively Callable Reserve. As may be seen from the accompanying chart (one of a number used by Mr. Burgess) men who enlist in the Armed Forces and serve for a period of five years or more therein pass immediately upon discharge to the Stand-by Reserve to fulfill their total eight years obligation.

Direct Enlistment in the Reserve

There are two new provisions in the plan which pertain to young men prior to reaching the age of 19. Both of these are subject to control by the President as to the number to be enrolled. One of these programs is that providing for direct enlistment in the Ready Reserve up to age 19 instead of 18½ as at present. Under this program it is definitely provided that the enlistee will be called to active duty within two years of the date of enlistment. It is expected that this program would be used particularly by the Navy and the Air Force, with the Air Force requiring four years of active duty.

Six-Months Training Program

The second new provision of the plan for direct entry into the Ready Reserve applies to young men between the ages of 17 to 19 who volunteer and who are willing to undertake a 10-year obligation. Young men entering the program would undergo a 6-months full time period of military training following which they would serve for nine and a half years in the Ready or "Service Callable Reserve" by joining either the National Guard or Army or Marine reserve units. It is provided that the number permitted to enroll in this group would be determined by the President with the advice of the Secretary of Defense and the Joint Chiefs of Staff. This number would be fixed initially at 100,000 trainees per year.

Manpower Pool

Mr. Burgess spoke of the importance of the size of the so-called "manpower pool" with respect to maintaining required active duty forces and building up adequate reserves. The term "manpower pool" does not mean the total possible resources of military manpower. As used here it means able-bodied men within fixed age limits who are available for active service and who have had no previous military training.

Under the plan the "manpower pool" would be maintained at sufficient size and composition as to age groups to insure support of the Regular Forces through enlistments and reenlistments. Moreover, the plan would insure that all men entering the pool would enter the Service before passing beyond the age of military eligibility.

Incentives and Penalties

Incentives for compliance with training programs in the Ready Reserve, under the plan, would include pay under the regular active-duty pay structure, veterans benefits, and certain provisions whereby a man might shorten the period of his service obligation by increasing his participation in the training program. On the other hand, failure to meet the training requirements could result in severe penalties under the plan. For instance, a 6-months trainee who might fail to participate satisfactorily in the required training would be subject to draft for active service for an additional 18 months. Penalties in the case of other programs could be reduction in rating, loss of retirement and remaining veterans' benefits and finally an other-than-honorable discharge. The plan contemplates a widespread educational program better to acquaint young men with their obligations for service under the law. This alone, it is believed, would go far towards insuring compliance.

Objectives to be Expected

In summarizing the Department's expectations from this plan Mr. Burgess said, "By 1959, assuming the maintenance of a 100,000 rate of six-months trainees annually, there would be approximately 750,000 untrained men in the pool available to meet the demands of the Services. At the same time, there would be the required numbers in the Active Forces, a Service Callable Reserve of approximately 3,000,000 and a Selective Callable Reserve broadly estimated at 2,000,000. This is the end product of the Department of Defense program."

Civilian Economy Needs

"In addition," continued Mr. Burgess, "to producing the military forces needed for national security, the plan includes two important provisions designed to lessen the impact on civilian economy.

"First, our Reserve concept contemplates a constant screening process to move essential civilian personnel out of the 'Service Callable Reserve,' and to control their subsequent recall through the Selective Service process.

"Second, the plan contemplates the use of the 6-months' active duty for training in lieu of the present two-year service requirement for highly skilled workers over age 19 in critical defense-supporting industries, when authorized by an Executive Order which would limit its application to specified groups and periods of time.

"In addition, the plan has sufficient flexibility to include other features in recognition of civilian needs as these needs manifest themselves."

CHANGE OF ADDRESS

Members are urged to keep the Secretary advised of address changes.

FOR OUTSTANDING SERVICE

CITATIONS OF CHEMICAL CORPS UNITS IN KOREA

92nd Chemical Service Company

388th Chemical Smoke Generator Company

69th Chemical Smoke Generator Company

71st Chemical Smoke Generator Company

4th Cml. Smoke Gen. Bn., Hqrs. & Hqrs. Det.

95th Chemical Smoke Generator Company

68th Chemical Smoke Generation Company

(Quoted from G.O. No. 95, Dept. of the Army. 22 Dec. 1953, par. 2.)

The 92ND CHEMICAL SERVICE COMPANY (second award), is cited for exceptionally meritorious conduct in the performance of outstanding service in support of combat operations in Korea during the period 1 July 1952 to 27 July 1953. Responsible for operating the Eighth Army Chemical Depot, three subdepots, six sections of ammunition supply points, and a maintenance section, the company at all times carried out its duties in a superior manner. During the fluid combat situation, the maintenance section was on call day and night to repair stationary flame throwers employed on the front lines as well as those installed on tanks and to assure that sufficient smoke equipment was ready whenever needed. Working throughout the entire Eighth Army area and supporting five times the normal number of troops for a unit its size, the company compiled an outstanding record in operating supply vehicles in the face of a rugged terrain situation and adverse weather conditions. Despite the extremely heavy workload already carried by its personnel, the company trained the cadre for two Republic of Korea units during a 4-month period. Although understrength and hampered by a rapid turnover of personnel, the 92ND CHEMICAL SERVICE COMPANY, the only one of its kind in Korea, displayed outstanding devotion to duty in the performance of exceptionally difficult tasks. The resourcefulness, initiative, and esprit de corps exhibited by the members of this company reflect great credit on themselves and the military service of the United States. *(General Orders 880, Headquarters Eighth United States Army, 23 September, 1953.)*

(Quoted from G.O. No. 22, Dept. of the Army, 30 March 1954, par. 8)

The 71ST CHEMICAL SMOKE GENERATOR COMPANY is cited for exceptionally meritorious conduct in the performance of outstanding services in support of combat operations in Korea during the period 4 April to 31 December 1953. Responsible for supporting front-line infantry, armor, and Marine units in combat, the company performed its hazardous mission with courage and skill. Committed to combat with no previous field experience and forced by the tactical situation to operate two platoons in two widely separated locations, the company consistently maintained and supplied its generators over long periods of time under extremely adverse conditions. In every instance, the members of this organization, through stamina and initiative, overcame formidable obstacles to render the support which was vitally needed by combat elements. The 71ST CHEMICAL SMOKE GENERATOR COMPANY displayed such outstanding loyalty and devotion to duty as to set it apart from and above other units with similar missions. The aggressiveness and esprit de corps exhibited by members of this company reflect great credit on themselves and the military service of the United States. *(General Orders 81, Headquarters Eighth United States Army, 25 February 1954.)*

(Quoted from G.O. No. 22, Dept. of the Army, 30 March 1954 par. 16)

The 388TH CHEMICAL SMOKE GENERATOR COMPANY (Augmented) (Second award), is cited for exceptionally meritorious conduct in the performance of outstanding services in support of combat operations in Korea during the period 1 May to 31 December 1953. Providing constant forward area smoke support to elements of two United States corps, the company at all times rendered the most effective and efficient service possible. When elements of the company withdrew from the demilitarized zone after the cessation of hostilities, the organization continued to display determination and aggressiveness in all its post-armistice functions. Despite a language barrier, members of the company succeeded in training Republic of Korea Army personnel in smoke techniques. The outstanding initiative and devotion to duty displayed by the 388TH SMOKE GENERATOL COMPANY sets it apart from and above other units with similar missions. The loyalty and esprit de corps exhibited by the members of this company reflect great credit on themselves and the military service of the United States.*(General Orders 79, Headquarters Eighth United States Army, 25 February 1954.)*

General Orders No. 23, Department of the Army.

Washington 25, D. C., 31 March 1954, confirms The Republic of Korea Presidential Unit Citation awarded by citation dated 18 October 1953, by Syngman Rhee, President of the Republic of Korea, for exceptionally meritorious service to the Republic of Korea during the period 1 August 1952 to 30 September 1953, inclusive, to the following units of the United States Army:

2nd Logistical Command (C) and attached units which included the following Chemical units:

4th Chemical Smoke Generator Battalion, Headquarters and Headquarters Detachment*
68th Chemical Smoke Generator Company*
69th Chemical Smoke Generator Company*
95th Chemical Smoke Generator Company
*Second Award.

The citation describes the different types of services rendered by the 2nd Logistical Command (C) which was made up of elements of the various technical services, and concludes with this statement:

"The efficiency with which the responsibilities of the 2d Logistical Command (C) were discharged was due to the individual efforts of everyone concerned. The resulting services and assistance, accomplished under difficult conditions, is an inspiration to all free peoples and is in keeping with the highest traditions of the United States Army, the military service and the United Nations."

CLIMATIC FACILITY

(Continued from page 18)

room rests directly on the ground. Without this feature, after extended periods of operation at low temperature, the moisture in the soil under the room may freeze to a considerable depth. In previous instances of this, there has been an upward expansion of the soil which produced a heaving and cracking of the floor and damage to the walls.

The outside walls of these chambers are of metal clad plywood with all seams caulked, taped and provided with protecting strips. Plywood is also used on the inside of these walls and on the ceiling to confine the insulation and to give some added support to the inner metal walls. The inner walls, ceiling and floor are lined with sheets of stainless steel welded together. The metal-clad plywood forms a vapor seal on the outside of the chambers; the inner metal shell provides a vapor seal and protection to the insulation inside the chambers. Expansion joints ere provided in the walls and ceiling at frequent intervals.

Because of its interest in environmental physiology and the experience gained in the old hot room in the main building, the Applied Physiology Branch has taken the lead in the planning for the Climatic Facility and will have the responsibility for coordinating the tests to be carried out in it. Many other Branches in the Chemical Corps Medical Laboratories and in particular those of the Toxicology Division have problems in which environmental conditions such as temperature, humidity and air movement enter significantly. Some examples are: toxic effects of agents by inhalation or by skin contact; fit and leakage of the gas mask; and resuscitation procedures and physiological effects of atropine. Progress of work on such problems has been limited because means for controlling and varying these conditions have been lacking or inadequate. With the completion of the Climatic Facility, these Branches will be able to improve the applicability of their findings to the military situation. Other agencies of the Chemical Corps are invited to examine the potentialities of the Climatic Facility with a view to using it in the solution of some of their own problems.

SAYRE IS MADE A BRIGADIER GENERAL

At Press Time it was Learned that Colonel Sayre's Nomination was Confirmed

Colonel Clifford L. Sayre, Chemical Corps Reserve, has been nominated for promotion to the grade of brigadier general.

Colonel Sayre is Development Chemical Engineer with the Buffalo Electro-Chemical Company and is president of the Western New York Chapter of A.F.C.A., with headquarters in Buffalo, N. Y.

Colonel Sayre was born November 23, 1899, at New Brighton, Pa. He studied chemical engineering at Carnegie Institute of Technology and was commissioned as a second lieutenant in the Chemical Warfare Reserve on June 19, 1924. He entered on active duty in the grade of major in 1941 and served during the war in a number of important assignments, including that of executive officer of the Materiel Command in the office of the Chief. Colonel Sayre's services during the war drew upon his extensive engineering experience in chemical facility construction, particularly with respect to chlorine plants. He was awarded the Legion of Merit.

Following return to inactive status Col. Sayre was recalled to active duty in September 1951 and served until March 1953 as a commanding officer of the Engineering Agency, Army Chemical Center.

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PRODUCT DEVELOPMENT

(Continued from page 29)

equipment design with emphasis on the endeavor to match human beings with modern machines is now called human engineering. The Chemical Corps Engineering Agency currently is studying the application of established human engineering principles and procedures to the design of Chemical Corps materiel.

A responsibility of the Packaging Engineer is the study and evaluation of materiel to determine whether the design lends itself readily to preservation, packaging and packing in a manner which assures not only adequacy of protection for hazards anticipated, but also furnishes protection at a minimum of cost of manpower and materials, and with a minimum of space required in transit and storage. It has been demonstrated that the results of such evaluation when applied to items being manufactured in large quantities has produced savings amounting to astronomical proportions. For example, the redesign of one item to afford a more compact pack, resulted in the savings of a million dollars in overseas shipping charges alone. The redesign of another item, which is now under study, will result, it is estimated, in the requirement of only one-twelfth of the warehouses, the railroad cars and the ships necessary for the storage and shipment of 100,000 of the items as originally designed. The requirements for this particular item would exceed this quantity many times in wartime. The economic and logistic significance of such evaluation and modification is, therefore, apparent.

Another example of how the Chemical Corps Engineering Agency applies specialty engineering in its work is accomplished within its mission in plant and end item design. Herein, the Chemical Corps Engineering Agency finds it necessary to apply modern management engineering techniques to design problems. The Chemical Corps Engineering Agency is not concerned with that part of the management engineering field which deals with organizational structure, but it is concerned with that portion of management engineering which periodically reviews plants and production lines design for simplification of flow, reduction of manpower, economy of operation and conservation of time and materials. Relationship between the operator and the Chemical Corps Engineering Agency activity in this filed therefore covers careful review of designs using management engineering criteria to make sure that all designs reflect the best in modern industrial engineering principles and practices, thus easing the subsequent task of the plant industrial engineer in improving efficiency by Methods Improvement, Process Controls, and the other tools of his profession.

The Quality Engineer and Statisticians apply techniques based on mathematical statistics and probability to the designs in development. From evaluation of development data and results of early production, the expected performance and variability of process and product are estimated, singling out critical points in manufacture. From these, quality requirements are established for production using sampling methods of acceptance, which minimize the risk of wrong decisions to both government and manufacturer, and reduce the total cost of testing. This leads to economy in procurement through the elimination of expensive and impractical demands of perfection in unessentials while assuring a high degree of quality in characteristics affecting service use. Throughout the subsequent history of the product, process, or specification, effective statistical techniques continue to support the engineers in decisions concerning materials, modifications, process difficulties and the disposition of unserviceable material.

Specialization and Mass Production

An examination of industrial history reveals a historical basis for these various fields of engineering specialization in the development of an item from research to production. In medieval times, the products which were needed were produced by the draftsmen. Each craftsman decided on what he could sell or use, planned its size, shape, function, and the raw material to be utilized in its manufacture. He then procured the material and manufactured the end product with his own tools. After the manufacture, he usually acted as distributor and salesman.

With the advent of the Industrial Revolution, machinery and manufacturing plants developed, and the manufacturing functions split, of necessity, into working groups and the development, incentive, and planning groups. As the industrialization became more complex, it became evident that the specialization would be necessary, so along with the division of labor came the concept of the production line and mass production. The development men became specialists in distinct fields of development. Coordination of their work added yet another job. The worker himself developed into many types, machinists, lathe operators, machine operators, setup men, maintenance men, laborers, and innumerable others. These people in turn required supervision and coordination.

Another field, born of necessity, entered the picture with industrialization and mass production. This field is characterized by the various types of engineers utilized in the Chemical Corps Engineering Agency. The existence of a requirement for these enginers is due to the complex problem of assaying the desired product and revising it when necessary, in order to make it more easily manufactured. The necessity for the introduction of manufacturing and production knowledge to the finalization of the prototype can be easily seen. The Development Engineer, if called upon actually to include all of these tasks along with his primary development task, would be overwhelmed with work. On the other hand, the development engineer cannot devise a more practical and efficient prototype without a consideration of the various fields of production, process and manufacturing engineering, and their effect on proposed designs.

By making available this type of engineering specialization, bridging the gap between research and production, the Chemical Corps Engineering Agency assures the mass production of functional Chemical Corps items for the soldier in the field.

Facilities Design

The Chemical Corps Engineering Agency furnishes technical and administrative services for the Chemical Corps in the planning, development and construction of Chemical Corps Research and Engineering Command facilities, located at Army Chemical Center, Dugway Proving Ground, Yuma Test Station and Arctic Test Center, Big Delta. In performing these functions the Agency reviews and evaluates construction projects, prepares design criteria and conducts technical reviews of Repairs and Utilities Projects.

The Chemical Corps Engineering Agency gives technical assistance as consulting engineers on research and engineering matters in which the Corps of Engineers is involved. This includes assembly of Chemical Corps requirements and preparation of drawings and justification documents to accompany requests for military construction, alterations and maintenance; assistance to Post Commanders in Master Planning; liaison with District Engineers during construction of projects for technical use; and following and reporting progress of construction and status of funds, both expended and available.

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IN THE WAKE OF THE GOLDEN GALLEON

OR

SELECTING A JUNGLE PROVING GROUND

By Robert D. McLeod, Jr.
Colonel, U.S.A., Ret.

After my return from a survey of the South Pacific Theatre of Operations, Major General William N. Porter, Chief, Chemical Warfare Service, decided that a chemical corps proving ground should be established in the tropics.* For logistical reasons it was decided to locate the proving ground in the Central American area rather than in the South Pacific. Lieutenant Colonel George W. Perkins of the Field Requirements Section, Office of the Chief, Chemical Warfare Service, proceeded to lay the groundwork for the project while I wound up my affairs at Headquarters, Fourth Air Force. During this interim period I made a trip to Mt. Shasta where a group of Division Ten NDRC Scientists were conducting cloud travel experiments. I also visited Dugway Proving Ground where the commanding officer, Colonel John R. Burns, was most cooperative in giving advice and suggestions for the proposed project. On 13 September 1943, orders were issued relieving me from Headquarters, Fourth Air Force and assigning me to the Office of the Chief, CWS. Before leaving San Francisco I was informed that Dr. Carey Croneis of the University of Chicago would accompany me on my search for a suitable site for a jungle proving ground. We met in Washington and we flew down to Panama, arriving on October 2, 1943.

We reported to Headquarters, Caribbean Defense Command and were assigned quarters at the old Army post of Corozal. The headquarters of both the Caribbean Defense Command and of the Panama Canal Department were at Quarry Heights. As the name would suggest, this was on a high hill overlooking the Bay of Panama. The road to the Headquarters was very steep with many curves. However, the vegetation was beautiful and the view magnificent.

Shore Line of San José

At Quarry Heights we met Brigadier General W. C. Christie, Chief of Staff, PCD; Brigadier General Douglas L. Weirtz, Chief of Staff, DCD; Colonel Hal Walmsley, Chemical Officer and a number of other officers. At a conference we stated our mission. Everyone was very cooperative and we received a lot of good advice and many suggestions as to possible sites. Arrangements were made for us to have the use of a military airplane based at Albrook Field, and we were given excellent maps of the entire area.

Our first trip was a general survey of the eastern half of the Isthmus of Panama. On most of our trip we were accompanied by Lieutenant Colonel Herbert H. Hollowell, Chemical Officer of the Sixth Air Force; Major Wyman F. Kemp, assistant chemical officer of PCD; and a photographer from the Sixth Air Force. We flew across the Isthmus to the San Blas Islands and observed them from the air. They might be called the Venice of Panama as the San Blas Indians have their homes on the islands but their farms are on the mainland. The islands are small, very crowded and quite picturesque. The San Blas Indians are quite proud and have a reputation for being good fighters. We landed at a small airstrip on the mainland to examine the terrain. It was covered by an excellent jungle for our purpose but obviously too full of natives to use as a proving ground.

From there we flew down to an airstrip near the Columbian border. On our return to Albrook Field we followed the course of the Tuira River to its junction with the Chucunaque at El Real; then down the river to the Gulf of San Miguel. Every time that we saw a likely looking spot for our test area we would soon afterwards see a native settlement down stream from the area which would be in the danger zone. When we reached the Gulf of San Miguel we turned north and followed the shore for a short distance. Then we turned to the west and passed over a number of well wooded islands including the Perlas Group. Several towns and an airfield were located on Rey Island, the largest of the group. There were also smaller settlements on some of the islands.

Cutting Trail Through Jungle—San José. Col. McLeod, second from left.

*Colonel McLeod described his trip to the South Pacific in articles published in the September-October and November-December 1954 issues of the Journal.

After a brief survey of the entire group of islands we returned to Albrook Field.

Our next flight was to the Galapagos Islands, stopping first on the way at Salinas, Ecuador, a little fishing village which is on a point of land lying between Santa Elena Bay and the Gulf of Guayaquil. The airfield was on a flat, barren piece of desert land but the town itself was rather attractive. As might be expected, the seafood was excellent and Salinas is noted for a huge shell fish resembling a Florida lobster that they call Langouste. Fresh water was scarce in the town and was brought in by barrels rolled on a rolling road similar to the tobacco roads which we once had in the United States. The next morning we continued on our journey to the Galapagos, landing on an airfield at Seymour Island. This was a small flat volcanic piece of land whose principal vegetation was cactus and whose animal life consisted of goats and the world famous Galapagos turtles. Since there was almost no fresh water on the island the goats had survived by eating cactus, quills and all, which gave them both food and drink. The turtles were huge creatures with feet almost as big as those of a small elephant. The shells of these creatures were big enough to use as a cover for a well. Both the Navy and the Air Force had extensive installations on the island.

We made a careful study of the maps of the islands and then made an aerial survey. To the northwest of Seymour Island was the uninhabitated island of San Salvador. We were told that a detachment of troops had been sent over to that island to see if water could be obtained from some springs which were visible from the air. The detachment landed and climbed across the rugged lava rock to the springs, which they found contained no water fit to drink. The water that they carried was nearly gone when they reached the springs. On the way back to the shore an attempt was made to supply them with water dropped from airplanes. However, no cargo parachutes were available and cans of water which were dropped split open and the water was lost. The party finally reached the shore nearly exhausted and suffering severely from thirst. We flew over the island and were soon convinced that it was much too rugged for any kind of a test area, and since it was devoid of vegetation it certainly was not suitable for jungle tests. We also flew over to Isabela Island and Fernandina Island. These islands were very interesting. They are formed by a series of active volcanoes, the highest of which reaches an altitude of 4698 feet. Steam and sulphur fumes were rising from the craters and deposits of sulphur were visible inside the craters. We had removed the door of the airplane so that our photographer could get better pictures. He had been strapped in the doorway so that he was safe enough, but Dr. Croneis, being a geologist, became so excited that he practically sat on the photographer's lap to get a better view. I was afraid that he would fall out and that I would have to report that he was last seen headed for the mouth of a volcano. However, we survived the volcanoes without losing the good Doctor and started to study the terrain and vegetation which was most peculiar. The islands are located on the equator, yet the Humbolt Current, a cool ocean stream similar to our Labrador Current, flows nearby. This results in a heavy overcast over the islands most of the time but there is very little rain. The higher mountains are often blanketed by the low lying clouds and sufficient moisture is imparted to support comparatively heavy vegetation at the higher altitudes. However, due to lack of rain there are no rivers. As a result, the vegetation thins out at the lower levels and after passing through a zone of thorn bushes becomes desert near the seashore. This is just the opposite of our western mountains where lush valleys thin out to a timber line at the higher altitudes. As we flew over the meadows on the higher ridges we noticed large herds of wild cattle, evidently the descendants of tame cattle first introduced by the Spaniards. We saw a number of big black bulls that would have been prized in a bull ring. A beautiful bay in which sportsmen's yachts used to gather when they came to the islands for game fishing was now vacant. On a sheer cliff the name and dates of the various ships that had anchored there were painted. The crew of each ship tried to climb as high as possible so that the name of their vessel would be higher than the other. After leaving Isabela Island we flew over Santa Cruz Island and then back to the base on Seymour Island.

Sandy Beach at bay, San Jose Island.

Typical Jungle on San Jose Island.

These islands form a large archipelago belonging to Ecuador, lying in the Pacific about 650 miles west of South America. They consist of twelve large islands and several hundred small ones. Only three or four are inhabited, the total population of the entire group in 1941 being about two thousand people. The islands are of volcanic origin and contain a number of active volcanoes. Many of the islands are raw masses of lava and have little or no vegetation. The newness of the land and its isolation from all other land masses has resulted in a distinctive flora and fauna which formed a basis for the works of Darwin on the origin of the species.

On the island of Santa Maria is the world renowned Post Office bay. In the early days of the whaling, ships southbound would stop at Post Office bay and leave mail in a barrel which they wished returned to the United States or mail addressed to men on ships already in the antarctic. The ships returning from the antarctic would stop at Post Office bay, pick up any mail addressed to the men on their ship or any mail destined for the United States. This system apparently worked out to the satisfaction of all concerned.

Since we had not seen any terrain which looked very promising from the air, it was considered advisable to confirm our aerial observations with a reconnaissance on the ground. We obtained permission to travel on a boat which made a regular run to Academy Bay on Santa Cruz Island to pick up fresh fruit and vegetables from a small plantation. The boat was equipped with fishing rods and other equipment so we had some very fine fishing on the way down and back. We did not try for any of the large game fish but found the fishing for ordinary eating fish, such as spanish mackerel, excellent. When we reached Academy Bay we were met by the Commandant and a detachment of Ecuadorian soldiers. Also in the party which met the boat were a number of Scandinavian men, women and children. We had landed on an Ecuadorian holiday and were taken to the Commandant's house for a little celebration. There we were served some local wine with which we toasted Ecuador and the United States. Among the Scandinavians present was an old Icelander who had once lived in San Francisco, California. He had sailed his own boat down to Academy Bay where he had built himself a little stone house near the seashore. He volunteered to guide us up to a Norwegian plantation which was up on the mountain. Leaving the semidesert of the shore we passed through an area of thorn bushes. The lava rock cut our shoes and the thorn bushes tore our clothes. We emerged from the thorn thicket into tropical vegetation and soon came to the plantation. Here we were served some pineapple and other tropical fruits. I never did find out the exact history of the Norwegian colony and how they happened to migrate to such an out-of-the-way place. However, they seemed quite content and were getting along well with the Ecuadorians. Dense vegetation grew in the neighborhood of the plantation but it was not the type of jungle we were looking for. Also, since the land was just one steep slope from the top of the mountain down to the sea and was composed of sharp lava, the terrain was not suitable for test work. After a brief stop at the plantation we returned to our boat and sailed back to Seymour Island. At Seymour Island we were presented with a card making us members of Ye Ancient and Honorable Order of Goat Whiskered Galapagons which indicated that we had spent at least three days on the Galapagos Islands.

Our next flight was to Talara, Peru. This town is located on the Northwest Coast of Peru. The territory around Talara is largely desert but is one of the most important oil producing areas on the West Coast of South America. Dr. Croneis, as a true geologist, tried to point out from the air the geological dome formation which indicated the probability of oil in the vicinity. In spite of the expert instruction I am afraid I could pass right over a second Teapot Dome and not realize that there was oil deep in the ground. We landed on the airfield and visited the town. It reminded me very much of a Mexican town in lower California. In the shops were very wonderful blankets made of llama wool and dyed to resemble animal skins. These were called tiger blankets and we all bought some to take home. A great variety of handmade silver jewelry was on sale quite cheap. The Peruvians distill a fiery beverage known as Pisca brandy. It has a kick like a mule but can be used to make a very excellent punch.

After spending the night at Talara we returned to Salinas, Ecuador just long enough to pick up some mail and then flew back to Albrook Field. About half way to Panama we ran into a terrific storm. The rain came down in sheets but the old C47 plowed right through, never faltering. When we landed water ran out of various crevices in the plane for some time. I still don't see how the engines kept running.

The next trip on our schedule was to Cocas Island which lies about 300 miles west of Panama. The island belongs to Costa Rica and is supposed to contain pirates' buried treasures which a number of expeditions have failed to find. At the time of our trip it was uninhabited and since there was no landing strip on the island we made the trip in a Navy seaplane. The Naval Air Station was located at Coco Sola on the Atlantic side of the Canal Zone. On our way to the island we ran into a number of rain storms and misty weather. The visibility was so poor that we had to use radar to find the island. It finally came into view and was a beautiful sight, densely covered with tropical forests and with extremely hilly steep cliffs rising from the shore. A number of waterfalls plunged over the cliffs on down to the sea. On the northern coast were the remains of a small settlement but no signs of life. We observed a brightly colored buoy and were told by our Navy friends that this buoy was connected to a hose on the end of a water line. Passing ships could pick up the hose and fill their water tanks with fresh water which had been impounded in a dam on the island.

We were unable to observe any place on the island where a landing strip could be built and few places that would be suitable for a camp. As supporting plans would have to make a 700-mile round trip on each mission it was obvious that Cocas Island would be impractical for our tests.

Since the weather was so bad and we had seen enough of the island to know its possibilities and limitations, we did not try to land but proceeded on to Corinto, Nicaragua. The next morning we flew down the Pacific Coast of Central America looking for possible sites. The most promising spots observed were Coiba Island, Jacaron Island and Cebaco Island. All belong to Panama. Coiba seemed to be the most promising. When we got back to Panama we checked up on these islands and found that a portion of Coiba was the Panamaian penal colony. We might still have been able to use it as it was a large island, but the presence of the prisoners might have complicated our problems.

We next traveled to San Jose, Costa Rica by Army plane. We crossed over to the Atlantic side of the Canal and carefully examined the shore line of Mosquito Gulf. The very name was enough to discourage us. An abundance of forests existed here but much of it was very swampy land that would have been difficult to use for test purposes and very poor as a camp site. As we flew

slowly up the shore we saw a native with a machette who had captured a huge turtle. He had turned it on its back and was cutting it open with his machette.

Later we arrived in San Jose, Costa Rica. It is high enough above sea level to be comfortable and the people are very friendly. In the middle of the city is a public park with a circular sidewalk around it. Every evening all of the girls who do not have a date gather and walk around the square while at the same time all the young men who do not have a date walk around in the opposite direction. As they pass each other they look for someone who strikes their fancy and after several trips around the circle they pair off for the evening. We all thought it would be a wonderful system for Washington, D.C., where they have lots of young people who have few acquaintances in town, and there are a lot of circles. A lively night club was situated across the street from the circle so the couples did not have far to go for entertainment. The next day we returned to Panama by way of the Pacific Coast taking another look at Coiba and the Perlas Islands on the way home.

By this time we felt that we had pretty well covered the area. We considered that for our tests we needed an island or peninsula that could be closed off from intruders, we wanted it to be within reasonable range of existing airfields, it must have a good jungle growth, and should have a good camp site. The Perlas Islands seemed to fill all of our requirements and of the Perlas Islands, the island of San Jose appeared to be the most promising. Despite the fact that San Jose was known as early as 1524, it was an island of mystery. The island was said to be haunted and full of wild animals. No natives would live on the island. A small naval observation post was on the southern tip of the island.

We made the necessary arrangements for an airplane to take us to the landing strip on Rey Island where we were to be met by a boat which would take us over to San Jose Island.

San Jose is the second largest island of the Perlas group, being about seven miles long and three miles wide. It is of volcanic origin, and the soil is reddish decomposed lava with outcropping of quartz and basalt. It is quite hilly, the highest point of land being 445 feet above sea level. The vegetation along the shore consists of a very dense mass of scrub jungle, a few stands of coconut palms, some wild sugar cane and some mangroves in the swamps. Away from the shore are the tall trees of the true jungle, the finest of which are in the valley of the Rio Marina. One small spot of grassland on the highest point in the island was later named Bald Hill. Several fair sized streams of good water were on the island, the largest of which is the Rio Marina. Abundant rain falls except in the two dry seasons. The real dry season is from around the first of January to the first of April; this is followed by the little dry season which lasts about six weeks during the summer months.

At one time an Englishman had a plantation on the island. He was killed by the natives and his plantation reverted to the jungle. His ghost was supposed to haunt the island and no native would go there.

We landed at Rey Island on a fighter strip built across a narrow peninsula on the southern end of the island. At each end of the strip was a steep cliff which dropped off about 100 feet to the sea below. Along the strip were large signs which said "one quarter," "one half," "three quarters," and finally "That's all brother." We went down to the landing where our boat was waiting for us and took off for San Jose Island. As we sailed along we were escorted by flights of pelicans. These birds flew in perfect formation just skimming the water looking for fish. When they spotted a school of fish they would dive down and come up with a wriggling meal. Ever so often we would see a huge form rise into the air and come down with a resounding splash. We were told that these were the giant ray fish. They are shaped like a bat and weigh about a ton. We saw many of them during our trip. The first bit of land that we passed as we approached San Jose Island were some rocks called the Tres Pilas de Arroz. Shortly afterwards we spotted the Naval Lookout Station high on a cliff, and turned in to a small bay which was their anchorage. There were many rocks in the bay and it was unsafe to bring our vessel too close to shore so we had to go ashore by means of a small boat. The sea was quite rough and it was decided that only two could ride safely in the boat so Dr. Croneis and I made the trip ashore. We landed at the foot of a trail and walked up to the naval installation. There we were offered a coke and given a lot of information about the island. We were told that the water was so pure that they could drink it without treatment, that there were no symptoms of malaria on the island and that no poisonous snakes had been found. However, there were some big boa constrictors and a lot of wild pigs. There was a wonderful view from the naval camp and a good breeze kept it very cool.

We returned to our boat and continued around the island. About half way up the west shore we found one of the most beautiful little bays I have ever seen. It had a gleaming white beach lined with coconut palms backed up by an extremely thick jungle.

The bay was quite calm and we had no trouble getting our entire party ashore. After exploring the beach we started to cut our way into the jungle and up a small hill to get an idea of the type of vegetation on the island. We soon found out. After about an hour's vigorous cutting with a machette we were barely a hundred yards in from the shore. We were convinced that we had a typical jungle and returned to the beach where we quenched our thirst with coconut milk. We rowed back to the boat and continued our trip around the island. We had been sheltered from the sea while on the western side of the island but once we rounded its northern tip we ran into rougher water. The shore line most of the way was steep and rugged with very few anchorages for even a small boat until we reached a little bay about the middle of the eastern shore. This bay, later called East Harbor, would normally have been a fairly good anchorage but on that particular day it provided little shelter. By that time the sea was getting very rough so we decided to return to Rey Island. After a very rough trip in which a number of the members of the party got seasick we reached Rey Island where we spent the night listening to the wind howl outside and the surf pound. The following morning the storm had subsided and we were able to fly back to Albrook Field. We were all impressed by the beauty of San Jose Island and its many advantages as a site for a jungle testing area. It was the unanimous choice of the party so we prepared a report to the Chief, Chemical Warfare Service recommending its selection. Among the advantages listed were lack of human habitation, safety distances to nearby islands, tropical jungle, good water, absence of disease and poisonous snakes, and the fact that the island could be supported by the Canal Zone and adjacent airfields. A unique advantage which was cited was the legend of the island being haunted. That ghost was worth a battalion of MP's in keeping curious natives out of the danger zone. We obtained an estimate of the cost of necessary construction from the engineer then flew back to Washington and submitted our report to the Chief, Chemical Warfare Service. The report was accepted and soon plans were underway for the San Jose Project.

BRIEFS

Maj. Gen. Wm. M. Creasy, Chief Chemical Officer of the Army, making his first parachute jump while attending the parachute training course at Fort Campbell, Ky., last December.

TO HONOR GEN. SIBERT

Representative Albert Rains (D-Ala.) has introduced a bill (HR-171) honoring Maj. Gen. William L. Sibert, outstanding officer of the Corps of Engineers. General Sibert had a major role in construction of the Panama Canal and became the first chief of the Chemical Warfare Service organized in World War I.

The bill would give the name Sibert to the locks, dam, and town in the Canal Zone which now have the name Gatun.

MR. SILLS RECEIVES AWARD

Mr. Norris E. Sills, training instructor in atomic defense subjects in the Radiological Branch of the Chemical Corps School, Ft. McClellan, Alabama, received the Army Commendation for Meritorious Civilian Service, given for outstanding performance of his duties as an instructor. The award, which was signed by Lt. General A. R. Bolling, Third Army commander, was presented to Mr. Sills by Colonel Edwin Van Keuren, commandant of the school, at a ceremony attended by members of the faculty and staff.

DU PONT AIDE GIVEN U. S. DEFENSE JOB

Mr. Roger W. Fulling, manager of atomic engineering for the Du Pont Company, and formerly president of the Wilmington Chapter of A.F.C.A., has been appointed director of construction for the department of Defense by Secretary Charles Wilson.

Mr. Fulling was granted a one-year leave of absence by the Du Pont Company. He will be responsible for establishing standards in construction operations and the analysis and review of construction problems for the Army, Navy and Air Force.

CHEMICAL PROGRESS WEEK

The week of May 16-21, inclusive, has been designated as "Chemical Progress Week." The Manufacturing Chemists Association is supporting a program which will recognize throughout the country the many achievements of this country's chemists.

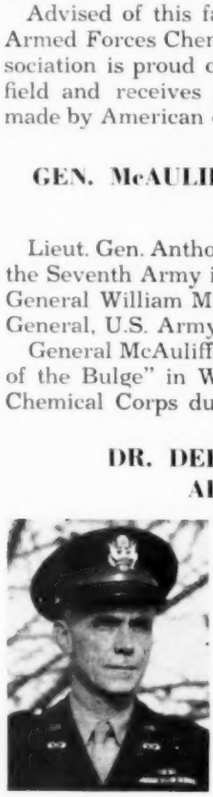
Advised of this fact, Admiral Prime, president of the Armed Forces Chemical Association, stated that the Association is proud of its position in this most important field and receives great inspiration from the progress made by American chemists.

GEN. McAULIFFE GIVEN EUROPE ARMY COMMAND

Lieut. Gen. Anthony C. McAuliffe, who has commanded the Seventh Army in Germany since 1953, has succeeded General William M. Hoge, now retired, as Commanding General, U.S. Army, Europe.

General McAuliffe, famed combat leader in the "Battle of the Bulge" in World War II, served as Chief of the Chemical Corps during part of the period 1949-51.

DR. DEFANDORF LEAVES CD ADMINISTRATION



Dr. James H. Defandorf, A.B., M.A., Ph.D., retired colonel of the Chemical Corps Reserve, who for several years has been on the staff of the Federal Civil Defense Administration concerned with special weapons defense, has resigned from that position to join the staff of the National Academy of Science, Washington, D. C.

Dr. Defandorf was formerly an Associate Professor of Pharmacology, George Washington Medical School. He was appointed Assistant Chief, Medical Research Division, Edgewood Arsenal, Chemical Corps in 1938 and until his retirement in 1952 served in the Corps continuously on either civilian or military duty assignments. He was commissioned in the Sanitary Corps, Medical Department of the Army in World War I and transferred to the Chemical Corps in World War II.

Dr. Defandorf is a member of Sigma Xi and the American Society for Pharmacology and Experimental Therapeutics. His home is in Chevy Chase, Maryland.

GENERAL ENGLISH HEADS COLLEGE

Brig. General Paul X. English, retired, organizer and first chief of the Industrial Division of the Chemical Warfare Service during World War II, is now president of Lewis College of Science and Technology, Lockport, Illinois.

General English, a graduate of Virginia Military Institute, was appointed a second lieutenant in the Infantry in 1912. He transferred to the Chemical Warfare Service in 1924 and served in that branch until his retirement after World War II in 1946.

THIS IS YOUR ARMY

Now being shown in moving picture theaters throughout the country is the color film, "This Is Your Army." This film is a feature length film produced by Movietone News for the Department of the Army. The selection of the material to be photographed, coordination, and provision of men and equipment involved the efforts of thousands of Army personnel at military installations throughout the world. Foreign governments through U.S. Army Military Missions cooperated. The Army states that perhaps no other motion picture has required participation of more people.

DR. HAFSTAD HONORED

Dr. Lawrence R. Hafstad, who retired recently as Director of the Atomic Energy Commission's Division of Reactor Development, has been granted the AEC's Distinguished Service Award.

The citation reads, in part, "Under his guidance, the country's first electric power was produced from nuclear fuel at the National Reactor Testing Station. He pioneered and administered with the Department of Defense a program for the development of military nuclear power plants for the Navy, Air Force and the Army, including the first nuclear powered submarine, the NAUTILUS. He was instrumental in the formation of a program of participation by industry, both technically and financially, in the development of nuclear power plants. Under his leadership, the Nation's first civilian nuclear power plant was recently placed under construction near Pittsburgh, Pennsylvania."

FOR SERVICE IN ALASKA

Outstanding service in Alaska as Fort Richardson's Chemical Officer and as Liaison Officer to local Civil Defense organizations has brought a commendation to Major Samuel Cox, (at right in picture), now of the Chemical Corps School. Presenting the citation is Colonel T. H. James, Deputy Commanding Officer, Chemical Corps Training Command.

MUSCLE SHOALS POLIO DRIVE

Pictured above is Lt. Col. Harvey E. Sheppard, Commanding Officer of the Muscle Shoals Project of the Chemical Corps, handing Miss Helen Murphy, center, in charge of the Lauderdale County Emergency Polio Drive, and Miss Helen Wood, right, in charge of the Colbert County Emergency Polio Drive, $100.00 checks each.

The contribution was made by the Chemical Corps military and civilian personnel at the project during their recent Polio Drive.

BOOK BY RED CROSS MAN

Mr. Joseph S. Salsburg, assistant Red Cross field director at the Army Chemical Center, has written a book of short stories entitled "A Child of Unknown Parents," which has been published by Vantage Press and placed on sale.

The volume consists of short stories, "short short" stories, articles, sketches, essays and a novelette.

A former resident of Mayfield, Pa., and an alumnus of the University of Miami (Fla.), Mr. Salzburg joined the Red Cross in 1951. For his work with wounded on the battlefields of Korea he received the highest civilian decoration awarded by the military—the Medal of Freedom.

NEW SYNTHETIC RUBBER

The Army has announced that a synthetic rubber considered especially applicable for certain military uses has been developed by the Office of the Army Quartermaster General in cooperation with industry.

Military applications envisioned for the new product, known by researchers as monochlorotrifluoroethylene fluorocarbon elastomer include fuel hose, diaphragms, gaskets, seals, "O" rings, tank linings, and containers and coatings for protective clothing, boots and gloves used in handling corrosive materials.

This rubber, the Army states, is resistant to strong acids, is affected only to a relatively minor degree by hydrocarbon fuels and lubricants, oxygen, ozone, and sunlight, and is non-flammable and abrasion and heat resistant.

GROUP AND SUSTAINING MEMBERS

OF THE ARMED FORCES CHEMICAL ASSOCIATION

Abbott Laboratories, North Chicago, Ill.
Aerial Products, Inc., Elkton, Md.
Air Reduction Company, Inc., New York, N. Y.
Allen Products Corp., Nashville, Tenn.
Allied Chemical & Dye Corporation, New York, N. Y.
American Aniline Products, Inc., New York, N. Y.
American Cyanamid Company, New York, N. Y.
American Zinc, Lead & Smelting Co., St. Louis, Mo.
Armour & Company, Chicago, Ill.
Armstrong Cork Company, Lancaster, Pa.
Atlas Powder Company, Wilmington, Del.
Baker & Company, Inc., Newark, N. J.
Baker, J. T., Chemical Company, Phillipsburg, N. J.
Barnebey-Cheney Company, Columbus, Ohio
Bastian-Morley Co., Inc., LaPorte, Indiana
Bayshore Industries, Inc., Elkton, Md.
BECCO Chemical Div., Food Machinery & Chemical Corp., Buffalo, N. Y.
Bechtel Corporation, San Francisco, Calif.
Bell & Gossett Company, Morton Grove, Ill.
Benjamin Reel Products, Inc., Cleveland, Ohio
Blaw-Knox Company, Pittsburgh, Pa.
Blickman, S., Inc., Weehawken, N. J.
Bridgeport Brass Company, Bridgeport, Conn.
Brown Company, Berlin, N. H.
Casco Products Corporation, Bridgeport, Conn.
Celanese Corporation of America, New York, N. Y.
Central Foundry Company, The, Newark, N. J.
Chamberlain Corporation, Waterloo, Iowa
City Chemical Corp., New York, N. Y.
Columbia-Southern Chemical Corp., Pittsburgh, Pa.
Continental Can Co., Inc., Chicago, Ill.
Continental Oil Co., Ponca City, Okla.
Crane Company, Chicago, Ill.
Curtis Industries, Inc., Helene, Chicago, Ill.
Diamond Alkali Company, Cleveland, Ohio
Dow Chemical Company, Midland, Mich.
E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
Edo Corporation, College Point, N. Y.
Eldon Manufacturing Company, Los Angeles, Calif.
Empire Stove Company, Belleville, Ill.
Esso Research and Engineering Co., New York, N. Y.
Evans Research & Development Corp., New York, N. Y.
Fairbanks, Morse & Co., Chicago, Ill.
Federal Laboratories, Inc., Saltsburg, Pa.
Ferguson, H. K., Company, The, Cleveland, Ohio
Ferro Corporation, Cleveland, Ohio
Firestone Industrial Products Co., Fall River, Mass.
Fisher Price Toys, Inc., East Aurora, N. Y.
Fisher Scientific Co., New York, N. Y.
Food Machinery & Chemical Corporation, New York, N. Y.
Foster Wheeler Corporation, New York, N. Y.
Fraser & Johnston Co., San Francisco, Calif.
General Aniline & Film Corporation, New York, N. Y.
General Tire & Rubber Company, The, Wabash, Ind.
Goodrich, B. F., Chemical Company, Cleveland, Ohio
Goodyear Tire & Rubber Company, Akron, Ohio
Gray Stamping & Manufacturing Co., Plano, Ill.
Gulf Oil Corporation, Pittsburgh, Pa.
Haertel, Walter, Company, Minneapolis, Minn.
Handy & Harman, New York, N. Y.
Harshaw Chemical Company, The, Cleveland, Ohio
Harvey Machine Co., Inc., Torrance, Calif.
Hercules Powder Company, Wilmington, Del.
Hesse-Eastern Corporation, Cambridge, Mass.
Heyden Chemical Corporation, New York, N. Y.
Hooker Electrochemical Company, Niagara Falls, N. Y.
Howell Company, The, St. Charles, Ill.
Hyman, Julius & Company, Denver, Colo.
Industrial Rubber Goods Company, St. Joseph, Mich.
International Business Machines Corporation, Endicott, N. Y.
International Nickel Co., Inc., New York, N. Y.
International Salt Co., Inc., Scranton, Pa.
International Silver Company, The, Meriden, Conn.
Jefferson Chemical Company, Inc., New York, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Kennecott Copper Corporation, New York, N. Y.
Kilgore, Inc., Westerville, Ohio
Koppers & Company, Inc., Pittsburgh, Pa.
Kwikset Locks, Inc., Anaheim, Calif.
LaBelle Industries, Inc., Oconomowoc, Wis.
Lambert Pharmacal Company, St. Louis, Mo.
Little, Arthur D., Inc., Cambridge, Mass.
Mason, L. E., Company, Hyde Park, Mass.
Mathieson Chemical Corporation, Baltimore, Md.
Merck & Company, Inc., Rahway, N. J.
Milwaukee Stamping Co., Milwaukee, Wisc.
Mine Safety Appliances Co., Pittsburgh, Pa.
Moe Light, Inc., Ft. Atkinson, Wisc.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Monsanto Chemical Company, St. Louis, Mo.
National Fireworks Ordnance Corp., West Hanover, Mass.
Niagara Alkali Company, New York, N. Y.
Niagara Blower Co., New York, N. Y.
Nopco Chemical Co., Inc., Harrison, N. J.
Oldbury Electro-Chemical Co., Niagara Falls, N. Y.
Olin Mathieson Chemical Corp., East Alton, Ill.
Oronite Chemical Company, San Francisco, Calif.
Parsons, Ralph M., Company, The, Los Angeles, Calif.
Pemco Corporation, Baltimore, Md.
Penick, S. B., & Company, New York, N. Y.
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.
Pfizer, Chas. & Company, Inc., Brooklyn, N. Y.
Philco Corporation, Philadelphia, Pa.
Phillips Petroleum Company, Bartlesville, Okla.
Pittsburgh Coke & Chemical Co., Pittsburgh, Pa.
Rau Fastener Co., New York, N. Y.
Rohm & Haas Company, Philadelphia, Pa.
Rudy Manufacturing Co., Dowagiac, Mich.
Shea Chemical Corp., Baltimore, Md.
Shell Development Company, Emeryville, Calif.
Sheller Mfg. Co., Dryden Rubber Div., Chicago, Ill.
Sherwin-Williams Company, The, Cleveland, Ohio
Shwayder Bros., Inc., Denver, Colo.
Standard Oil Company (Indiana), Chicago, Ill.
Stauffer Chemical Company, New York, N. Y.
Stewart-Warner Corporation, Chicago, Ill.
Sun Oil Company, Philadelphia, Pa.
Tranter Manufacturing, Inc., Lansing, Mich.
Unexcelled Chemical Corp., Cranbury, N. J.
Union Carbide & Carbon Corp., New York, N. Y.
United-Carr Fastener Corp., Cambridge, Mass.
United States Rubber Company, New York, N. Y.
Universal Match Corp., Ferguson, Mo.
Vitro Corporation of America, New York, N. Y.
Vulcan Copper & Supply Co., The, Cincinnati, Ohio
Western Electrochemical Company, Henderson, Nev.
Witco Chemical Company, Chicago, Ill.
Wyandotte Chemicals Corp., Wyandotte, Mich.
Zaremba Company, Buffalo, N. Y.
Zenith Plastics Company, Gardena, Calif.

Companies listed in bold face type are Sustaining Members.

RADIOACTIVE FALL OUT

The following statement by Lewis L. Strauss, chairman of the U.S. Atomic Energy Commission, was released to the press on February 15, 1955, together with a somewhat more detailed report of the Commission on the effects of high-yield Nuclear Explosions.

By LEWIS L. STRAUSS, *Chairman*
United States Atomic Energy Commission

AT A NEWS conference on December 17, 1954, I stated that the staff of the Atomic Energy Commission was studying the subject of fallout and expressed the hope that information about it would be made public at a later date. "Fallout" is the word now applied to a phenomenon that follows the explosion of a nuclear weapon. Such an explosion, if the fireball touches the surface of the earth, draws up large amounts of materials into the bomb cloud. These materials subsequently fall back to earth as radioactive particles over a large area, mostly down-wind and relatively close to the point of explosion —although the lighter particles are carried great distances. The main radioactivity of fallout decreases very rapidly with time—for the most part, within the first hours after the explosion. An in-the-air explosion where the fireball does not touch the earth's surface does not produce any serious radiological fallout hazard.

Since nuclear weapons are in possession of the USSR, the Commission believes the American people wish to be informed regarding the dangers of nuclear explosions and the measures which individuals can take to protect themselves if an atomic attack should ever occur. Therefore, the Commission has condensed in the attached Report the information which can be made public at this time on the effects of the explosions of high-yield nuclear weapons.

The following excerpts and summarized sections contain the highlights of the Report itself.

Fallout Pattern of 1954 Test in the Pacific

The very large thermonuclear device tested at Bikini Atoll on March 1, 1954, was detonated on a coral island and the ensuing fallout contaminated an elongated, cigar-shaped area extending approximately *220 statute miles down-wind and varying in width up to 40 miles.* In addition, there was a contaminated area up-wind and cross-wind extending possibly 20 miles from the point of detonation. Data was collected from 25 points on 5 atolls located from 10 to 330 miles down-wind (generally east) from Bikini Atoll. Due to an unexpected shift in the direction of the prevailing winds in the higher altitudes, the fallout missed the observation rafts that had been placed farther north previous to the test firing. The estimated contour of the pattern of fallout is, therefore, based only in part on data obtained from actual measurements and partly on calculations.

Data from this and other tests permits *estimates* of casualties which would have been suffered within this contaminated area if it had been populated. These *estimates* assume: (1) that the people in the area would ignore even the most elementary precautions; (2) that they would not take shelter but would remain out of doors completely exposed for about 36 hours; and (3) that in consequence they would receive the maximum exposure. Therefore, it will be recognized that the estimates which follow are what might be termed *extreme* estimates since *they assume the worst possible conditions.*

On the basis of our data from this test and other information, it is estimated that, following the March 1, 1954, test explosion, there was sufficient radioactivity in a down-wind belt about 140 miles in length and of varying width up to 20 miles to have seriously threatened the lives of nearly all persons in the area *who took no protective measures.*

Some distance farther from the point of detonation, at about 160 miles down-wind and along the axis of the ellipse, the amount of radioactivity would have seriously threatened the lives of about one-half of the persons in the area who took no protective measures.

Near the outer edge of the ellipse, or approximately 190 miles down-wind, it is estimated that the level of radio-activity would have been sufficient to have seriously threatened the lives of 5 to 10 per cent of any persons who might have remained exposed out of doors for all of the first 36 hours.

Thus, about 7,000 square miles of territory down-wind from the point of burst was so contaminated that survival might have depended upon prompt evacuation of the area or upon taking shelter and other protective measures.

At a distance of 220 miles or more down-wind, it is unlikely that any deaths would have occurred from radioactivity even if persons there had remained exposed up to 48 hours and had taken no safety measures.

The estimates cited above do not apply uniformly throughout the contaminated area inasmuch as the intensity of radioactivity within a region of heavy fallout

will vary from point to point, due to such factors as air currents, rain, snow, and other atmospheric conditions. Because of this and because most persons, if given sufficient warning, probably would evacuate the area or take shelter and other precautionary measures, the actual percentage of fatalities could reasonably be presumed to be considerably smaller than these extreme estimates.

Protection Against Fallout

In an area of heavy fallout the greatest radiological hazard is that of exposure to *external* radiation, which can be greatly reduced by simple precautionary measures. Exposure can be reduced by taking shelter and by simple decontamination measures. Test data indicates that the radiation level, i.e., the rate of exposure, indoors on the first floor of an ordinary frame house in a fallout area would be about one-half the level out of doors. Even greater protection would be afforded by a brick or stone house. Taking shelter in the basement of an average residence would reduce the radiation level to about one-tenth that experienced out of doors. Shelter in an old-fashioned cyclone cellar, with a covering of earth three feet thick, would reduce the radiation level to about 1/5000, or down to a level completely safe, in even the most heavily contaminated area. Designs of shelters of simple yet effective construction have been prepared by the Civil Defense Administration and are available to the public.

Radioactive material deposited during the fallout may or may not be visible but would be revealed by radiation detection instruments such as Geiger counters. Any falling dust or ash that can be seen down-wind within a few hours after a nuclear explosion should be regarded as radioactive until measured by a radiation detection instrument.

Care should be taken to avoid the use of solid foods or liquids that may contain fallout particles.

If fallout particles come into contact with the skin, hair, or clothing, prompt decontamination precautions such as have been outlined by the Federal Civil Defense Administration will greatly reduce the danger. These include such simple measures as *thorough bathing of exposed parts of the body and a change of clothing.*

Internal Radiation Effects

Two other factors must be considered in evaluating possible hazards from radioactive fallout. The first is the effect of internal radiation from fallout particles swallowed in food or liquids. The second is the effect of radiation upon the germ cells which transmit inherited characteristics from one generation to another. It should be noted that in neither case is there reason to believe that weapons testing programs of the United States have resulted in any serious public hazard.

The radioactive forms of strontium and iodine are the constituents of fallout which are of principal concern as internal sources of radiation through ingestion. The concentrations of these substances from nuclear detonations to date have been monitored at many localities, and the amounts detected have been insignificant, compared to concentrations which would be hazardous.

Genetic Effects of Radiation

There is a wide range of admissible opinion as to the genetic effects which radiation might have upon future generations, and conclusive data is not available at present on which to base an incontrovertible forecast. However, it is important to recognize that the average amount of radiation exposure received by residents of the United States from all nuclear detonations to date has been about the same as the exposure received from one chest X-ray. The Commission's medical and biological advisers do not believe that this small amount of additional exposure is any basis for serious concern at this time.

Blast and Heat Effects

Two important characteristics of any nuclear explosion, other than those from fallout, are the effects of blast and heat, which are of the same nature for a thermonuclear bomb as for the earlier and smaller atomic bombs. The intensity and area of the blast and heat effects increase in relation to the greater energy yield of the explosion. Much information on these two effects has already been published by the Atomic Energy Commission, but it might be recalled that an atomic bomb of the earliest type, equivalent to 20,000 tons of TNT, would produce blast and heat sufficient to destroy, or damage severely, buildings within a radius of more than one mile from the explosion point. The United States has developed fission bombs many times as powerful as the first atomic bombs, and hydrogen weapons in the ranges of millions of tons (megatons) of TNT equivalent.

Protection Against Blast and Heat

The hazard from both burn and blast effects well *outside* the central target area would be reduced greatly by shelter. Clothing or almost any kind of shelter would reduce the danger of direct burns, although there might be danger of clothing and structures becoming ignited. Also, shelter would materially reduce the hazard of blast injury by affording protection against flying or falling debris. As is generally known, the shelter afforded by ordinary city buildings would not suffice within the central area surrounding the point of explosion of a large nuclear weapon. For this reason, the Federal Civil Defense Administration recommends evacuation of the central areas of target zones on early warning of approaching attack.

Fallout From Nevada Tests

Only relatively small nuclear test explosions are conducted at the Nevada Test Site, in contrast to the tests of high-yield thermonuclear devices at the Pacific Proving Grounds. In Nevada, as well as in the Pacific, all tests are planned for times when forecast weather conditions minimize the possibility of fallout hazard. High air bursts at the Nevada Test Site have produced no significant fallout; heavy fallout from near-surface explosions has extended only a few miles from the point of burst. The hazard has been successfully confined to the controlled area of the Test Site. The highest actual dose of radiation at an off-site community has been estimated to be *less than one-third of the greatest amount of radiation which atomic energy workers are permitted to receive each year under the Atomic Energy Commission's conservative safety standards.*

Conclusion

In the event of war involving the use of atomic weapons, the fallout from large nuclear bombs exploded on or near the surface of the earth would create serious hazard to civilian populations in large areas outside the target zones. The Atomic Energy Commission hopes that these dangers will never be experienced by mankind. However, until the possibility of an atomic attack against us is eliminated by a *workable international plan for general disarmament*, the study and evaluation of the effects of weapons which might be used against us and the improvement of our means of self-defense are a paramount duty of our Government .